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Using the Business Policy Switch 2000

NORTEL NETWORKS™

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Preface

This guide describes the Nortel Networks Business Policy Switch 2000™ features and uses. The terms “Business Policy Switch 2000” and “Business Policy Switch” are used synonymously in this document. The Business Policy Switch introduces policy-enabled networking features to optimize consistent performance and behavior for your network traffic. The Differentiated Services (DiffServ) network architecture offers varied levels of service for different types of data traffic. DiffServ lets you designate a specific level of performance on a per-packet basis. For more information about configuring policy-enabled networking, see Chapter 4, “Configuring policy-enabled networks.”

The Business Policy Switch includes a dedicated Uplink Module slot for attaching optional media dependent adapters (MDAs) that support a range of media types, including Gigabit Ethernet. Installation instructions are included with each MDA (see your Nortel Networks sales representative for ordering information). For more information about the MDAs, see Appendix D, “Media dependent adapters.”

You can use the Business Policy Switch in:

- A standalone switch configuration.
- A Business Policy Switch 2000-only stack configuration.
- A mixed stack configuration consisting of BayStack 450, BayStack 410, *and* Business Policy Switch 2000 switches.

The Business Policy Switch 2000 provides fail-safe stackability when you install the optional BayStack 400-ST1 Cascade Module.

Before you begin

This guide is intended for network managers and administrators with the following background:

- Basic knowledge of networks, Ethernet bridging, and IP and IPX routing
- Familiarity with networking concepts and terminology
- Specific knowledge about the networking devices, protocols, topologies, and interfaces that comprise your network
- Experience with windowing systems, graphical user interfaces (GUIs), or Web browsers

Text conventions

This guide uses the following text conventions:

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is: **`ping`** <*ip_address*>, you enter: **`ping 192.32.10.12`**
`bold text`	Indicates command names and options and text that you need to enter. Example: Enter **`show ip`** {**`alerts`** | **`routes`**}. Example: Use the **`dinfo`** command.
braces ({})	Indicate required elements in syntax descriptions where there is more than one option. You must choose only one of the options. Do not type the braces when entering the command. Example: If the command syntax is: `show ip {alerts | routes}`, you must enter either: `show ip alerts or show ip routes`, but not both.

brackets ([ ])	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is: **`show ip interfaces [-alerts]`**, you can enter either: **`show ip interfaces`** or **`show ip interfaces -alerts`**.
ellipsis points (. . .)	Indicate that you repeat the last element of the command as needed. Example: If the command syntax is: **`ethernet/2/1`** [*<parameter>* *<value>*] **`. . .`** , you enter **`ethernet/2/1`** and as many parameter-value pairs as needed.
italic text	Indicates file and directory names, new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore. Example: If the command syntax is: **`show at`** *<valid_route>* *valid_route* is one variable and you substitute one value for it.
`screen text`	Indicates system output, for example, prompts and system messages. Example: `Set Trap Monitor Filters`
separator (>)	Shows menu paths. Example: Protocols > IP identifies the IP option on the Protocols menu.
vertical line (|)	Separates choices for command keywords and arguments. Enter only one of the choices. Do not type the vertical line when entering the command. Example: If the command syntax is: **`show ip`** {**`alerts`** | **`routes`**}, you enter either: **`show ip alerts`** or **`show ip routes`**, but not both.

Related publications

For more information about using the Business Policy Switch 2000, refer to the following publications:

- Using Web-based Management for the Business Policy Switch 2000 (part number 209570-A)

  Describes how to use the Web-based management tool to configure switch features.

- Installing the Business Policy Switch 2000 (part number 209319-A)

  Describes how to install the Business Policy Switch 2000.

- *Release Notes for the Business Policy Switch 2000* (part number 209320-A)

  Documents important changes about the software and hardware that are not covered in other related publications.

- *Installing Media Dependent Adapters (MDA)s* (part number 302403-D)

  Describes how to install optional MDAs in your Business Policy Switch 2000.

- *Installing the BayStack 400-ST1 Cascade Module (*part number 304433-B)

  Describes how to connect up to eight switches into a stack configuration by installing optional BayStack 400-ST1 Cascade Modules.

- *Getting Started with Business Policy Switch 2000 Management Software Operations* (part number 209321-A)

  Describes how to install the Java-based device level software management application.

- *Reference for the Business Policy Switch 2000 Management Software Operations* (part number 209322-A)

  Describes how to use the Java-based device level software management application.

- BayStack 10 Power Supply Unit (part number 208558-A)

  Describes installation, power-up, power-down and fan replacement procedures.

- *Release Notes for the BayStack RPSU/UPS* (part number 208560-A)

  Documents important changes about the *RPSU/UPS* that are not covered in other related publications.

- *Installation and Reference for the BayStack RPSU/UPS* (part number 208296-A)

  Describes how to install the optional RPSU/UPS to your Business Policy Switch 2000.

- *100 Watt DC-DC Converter Installation and Reference Guide* (part number 209132-A)

  Describes installation and removal procedures.

- *Reference Note: Gigabit Ethernet Physical Layer Considerations* (part number 201540-B)

  Provides information about gigabit transmission over fiber optic cable and mode conditioning.

You can print selected technical manuals and release notes free, directly from the Internet. Go to the *support.baynetworks.com/library/tpubs/* URL. Find the product for which you need documentation. Then locate the specific category and model or version for your hardware or software product. Use Adobe Acrobat Reader to open the manuals and release notes, search for the sections you need, and print them on most standard printers. Go to Adobe Systems at *www.adobe.com* to download a free copy of Acrobat Reader.

You can purchase selected documentation sets, CDs, and technical publications though the Internet at the *www1.fatbrain.com/documentation/nortel/* URL.

How to get help

If you purchased a service contract for your Nortel Networks™ product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

If you purchased a Nortel Networks service program, contact one of the following Nortel Networks Technical Solutions Centers:

Technical Solutions Center	Telephone
EMEA	(33) (4) 92-966-968
North America	(800) 2LANWAN or (800) 252-6926
Asia Pacific	(61) (2) 9927-8800
China	(800) 810-5000

An Express Routing Code (ERC) is available for many Nortel Networks products and services. When you use an ERC, your call is routed to a technical support person who specializes in supporting that product or service. To locate an ERC for your product or service, go to the *www12.nortelnetworks.com/* URL and click ERC at the bottom of the page.

Chapter 1
The Business Policy Switch 2000

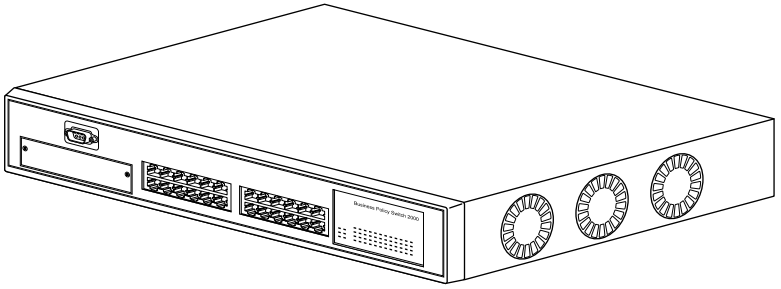
This chapter introduces the Business Policy Switch 2000 and covers the following topics:

- Physical description (this page)
- Overview of main features (page 39)

Physical description

Figure 1 depicts the front and side views of the Business Policy Switch.

Figure 1 Business Policy Switch 2000



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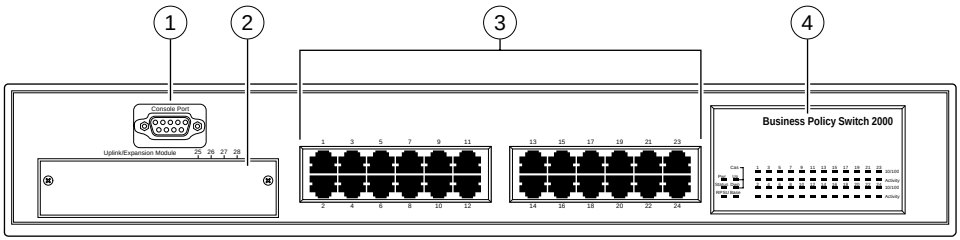
Front panel

Figure 2 shows the front-panel configuration for the Business Policy Switch 2000. Descriptions of the front-panel components follow the figure.

For descriptions of the back-panel Business Policy Switch components, see "Back panel" on page 35.

Figure 2 Business Policy Switch 2000 front panel



Business Policy Switch 2000

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Table 1 Business Policy Switch 2000 front-panel description

1	Console port
2	Uplink/expansion slot
3	Port connectors
4	LED display panel

Console port

The console port allows you to access the console interface (CI) screens and customize your network using the supplied menus and screens (see Chapter 3, "Using the console interface," on page 119).

The console port is a DB-9, RS-232-D male serial port connector. You can use this connector to connect a management station or console/terminal to the Business Policy Switch by using a straight-through DB-9 to DB-9 standard serial port cable. You must use a VT100/ANSI-compatible terminal (for cursor control and to enable cursor and functions keys) to use the console port. See *Installing the Business Policy Switch 2000* for more information.

Note: The console port is configured as a data communications equipment (DCE) connector. Ensure that your RS-232 cable pinouts are configured for DCE connections (see Appendix F, “Connectors and pin assignments,” on page 285).

The console port default settings are: 9600 baud with eight data bits, one stop bit, and no parity as the communications format, with flow control set to enabled.

Uplink/Expansion slot

The Uplink/Expansion slot allows you to attach optional media dependent adapters (MDAs) that support a range of media types (see Appendix D, “Media dependent adapters,” on page 261 for more information about MDA types available from Nortel Networks).

Port connectors

The Business Policy Switch uses 10BASE-T/100BASE-TX RJ-45 (8-pin modular) port connectors.

The 10BASE-T/100BASE-TX port connectors are configured as MDI-X (media-dependent interface-crossover). These ports connect over straight cables to the network interface card (NIC) in a node or server, similar to a conventional Ethernet repeater hub. If you are connecting to an Ethernet hub or Ethernet switch, use a crossover cable unless an MDI connection exists on the associated port of the attached device (see “Appendix F, “Connectors and pin assignments,” on page 285).

The Business Policy Switch uses autosensing ports designed to operate at 10 Mb/s (megabits per second) or at 100 Mb/s, depending on the connecting device. These ports support the IEEE 802.3u autonegotiation standard, which means that when a port is connected to another device that also supports the IEEE 802.3u standard, the two devices negotiate the best speed and duplex mode.

The 10BASE-T/100BASE-TX switch ports also support half- and full-duplex mode operation (refer to *Installing the Business Policy Switch 2000*).

The 10BASE-T/100BASE-TX RJ-45 ports can connect to 10 Mb/s or 100 Mb/s Ethernet segments or nodes.

Note: Use only Category 5 copper unshielded twisted pair (UTP) cable connections when connecting 10BASE-T/100BASE-TX ports.

See Appendix F, “Connectors and pin assignments,” on page 285 for more information about the RJ-45 port connectors.

LED display panel

Figure 3 shows the Business Policy Switch LED display panel. See Table 2 for a description of the LEDs.

Figure 3 Business Policy Switch 2000 LED display panel

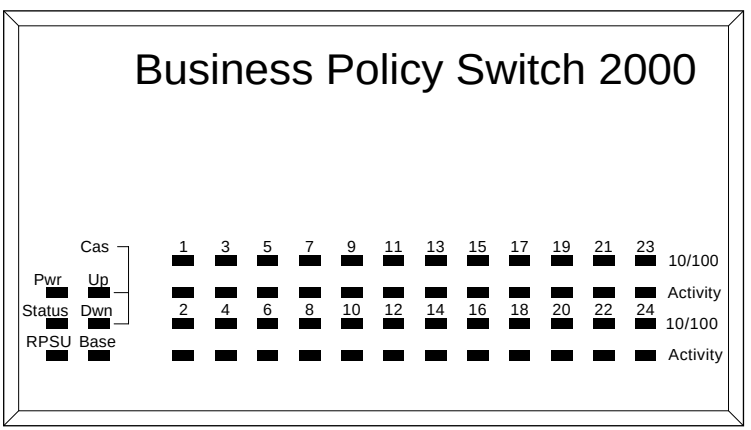

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Table 2 Business Policy Switch 2000 LED descriptions

Label	Type	Color	State	Meaning
Pwr	Power status	Green	On	DC power is available to the switch's internal circuitry.
			Off	No AC power to switch or power supply failed.
Status	System status	Green	On	Self-test passed successfully and switch is operational.
			Blinking	A nonfatal error occurred during the self-test.
			Off	The switch failed the self-test.
RPSU	RPSU status	Green	On	The switch is connected to the RPSU and can receive power if needed.
			Off	The switch is not connected to the RPSU or RPSU is not supplying power.
Cas Up	Stack mode		Off	The switch is in standalone mode.
		Green	On	The switch is connected to the *upstream* unit's Cascade A In connector.
		Amber	On	This unit has detected a problem with the switch connected to the cascade up connector. In order to maintain the integrity of the stack, this unit has bypassed its upstream neighbor and has wrapped the stack backplane onto an alternate path.
		Amber or Green	Blinking	Incompatible software revision or unable to obtain a unit ID (Renumber Stack Unit table full). The unit is on the ring but cannot participate in the stack configuration.
Cas Dwn	Stack mode		Off	The switch is in standalone mode.
		Green	On	The switch is connected to the *downstream* unit's Cascade A Out connector.
		Amber	On	This unit has detected a problem with the switch connected to the cascade down connector. In order to maintain the integrity of the stack, this unit has bypassed its downstream neighbor and has wrapped the stack backplane onto an alternate path.
		Amber or Green	Blinking	Incompatible software revision or unable to obtain a unit ID (Renumber Stack Unit table full). The unit is on the ring but cannot participate in the stack configuration.

Table 2 Business Policy Switch 2000 LED descriptions (continued)

Label	Type	Color	State	Meaning
Base	Base mode	Green	On	The switch is configured as the stack base unit.
			Off	The switch is *not* configured as the stack base unit (or is in standalone mode).
			Blinking	Stack configuration error: indicates that *multiple* base units or *no* base units are configured in the stack.
		Amber	On	This unit is operating as the stack configuration's *temporary base unit*. This condition occurs automatically if the base unit (directly downstream from this unit) fails. If this happens, the following events take place: • The two units directly upstream and directly downstream from the failed unit automatically wrap their cascade connectors and indicate this condition by lighting their Cas Up and Cas Dwn LEDs (see Cas Up and Cas Dwn description in this table). • If the temporary base unit fails, the next unit directly downstream from this unit becomes the new temporary base unit. This process can continue until there are only two units left in the stack configuration. This automatic failover is a temporary safeguard only. If the stack configuration loses power, the temporary base unit will not power up as the base unit when power is restored. For this reason, you should always assign the temporary base unit as the base unit (set the Unit Select switch to Base) until the failed unit is repaired or replaced.
10/100	10/100 Mb/s port speed indicator	Green	On	The corresponding port is set to operate at 100 Mb/s, and the link is good.
		Green	Blinking	The corresponding port has been disabled by software.
		Amber	On	The corresponding port is set to operate at 10 Mb/s, and the link is good.
		Amber	Blinking	The corresponding port has been disabled by software.
			Off	The link connection is bad, or there is no connection to this port.
Activity	Port activity	Green	Blinking	Indicates network activity for the corresponding port. A high level of network activity can cause the LEDs to appear to be on continuously.

Back panel

The switch back panel is shown in Figure 4.

Figure 4 Business Policy Switch 2000 back panel

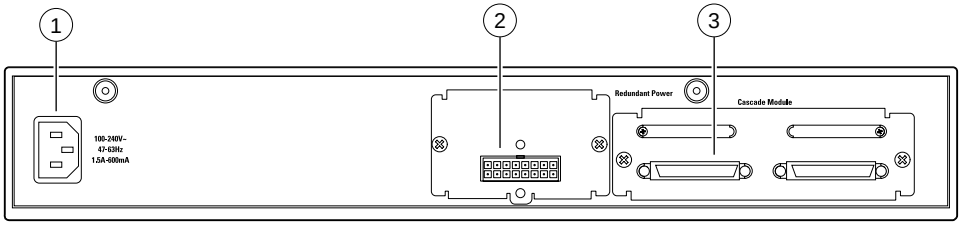


Table 3 Business Policy Switch 2000 back-panel descriptions

1	AC power receptacle
2	RPSU connector
3	Cascade Module slot

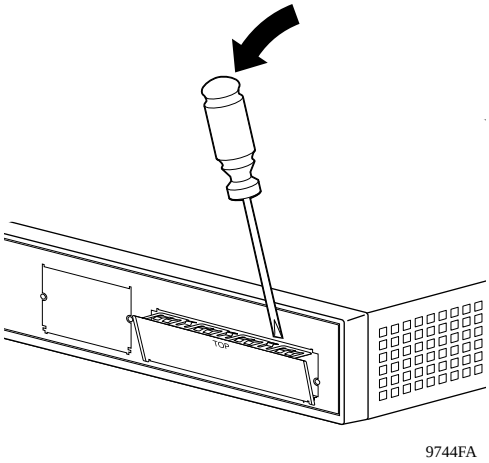
Cascade Module slot

The Cascade Module slot allows you to attach an optional BayStack 400-ST1 Cascade Module to the switch (see "Stack configurations" on page 63.

You can connect up to eight switches into a redundant stack configuration. Installation instructions are provided with each BayStack 400-ST1 Cascade Module (see *Installing the BayStack 400-ST1 Cascade Module*). Use a flathead screwdriver to remove the filler panel that covers the Cascade Module slot (Figure 5).

For more information about cascade modules, see *Installing the Cascade 400-ST1 Cascade Module*. See your Nortel Networks sales representative for cascade module ordering information.

Figure 5 Removing the cascade module filler panel



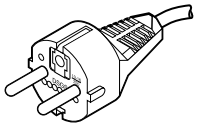
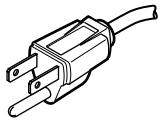
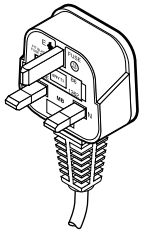
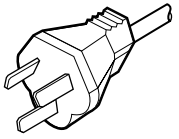
Cooling fans

Three cooling fans are located on one side of the Business Policy Switch to provide cooling for the internal components. (See Figure 1 on page 29.) When you install the switch, be sure to allow enough space on *both sides* of the switch for adequate air flow. See *Installing the Business Policy Switch 2000* for detailed information.

AC power receptacle

The AC power receptacle accepts the AC power cord (supplied). For installation outside of North America, make sure that you have the proper power cord for your region. Any cord used must have a CEE-22 standard V female connector on one end and must meet the IEC 320-030 specifications. Table 4 lists specifications for international power cords.

Table 4 International power cord specifications

Country/Plug description	Specifications	Typical plug
Continental Europe: • CEE7 standard VII male plug • Harmonized cord (HAR marking on the outside of the cord jacket to comply with the CENELEC Harmonized Document HD-21)	220 or 230 VAC 50 Hz Single phase	 228FA
U.S./Canada/Japan: • NEMA5-15P male plug • UL recognized (UL stamped on cord jacket) • CSA certified (CSA label secured to the cord)	100 or 120 VAC 50–60 Hz Single phase	 227FA
United Kingdom: • BS1363 male plug with fuse • Harmonized cord	240 VAC 50 Hz Single phase	 229FA
Australia: • AS3112-1981 Male plug	240 VAC 50 Hz Single phase	 230FA

Redundant power supply unit (RPSU) and uninterruptible power supply (UPS)

The redundant power supply connector allows you to connect a backup power supply unit to the Business Policy Switch. Nortel Networks provides an optional redundant power supply unit (RPSU) for this purpose. The BayStack 10 Power Supply Unit is a hot-swappable power supply unit that provides uninterrupted operation to as many as four Business Policy Switches in the event that any of the switch power supplies fail.

The BayStack 10 Power Supply Unit has a powerful, modular redundant and uninterruptible power supply (UPS) functionality in a single chassis. It provides scalable power redundancy and protection to your networking equipment. The modules fit into the right-hand side of the rear of the chassis. The UPS and associated battery pack module fit into the front of the chassis.

For further information, refer to *Installation and Reference for the BayStack 10 Power Supply Unit* (part number 208296-A). Contact your Nortel Networks sales representative for more information.

100 Watt DC-DC Converter

The 100 Watt DC-DC Converter operates in conjunction with the Nortel Networks BayStack 10 Power Supply Unit and 200 Watt AC/DC Power Supply Module. The 100 Watt DC-DC Converter provides a plug-and-play redundant power supply unit for the Business Policy Switch 2000, as well as other products available from Nortel Networks. Contact your Nortel Networks sales representative for information about the Nortel Networks products that use the 100 Watt DC-DC Converter.

For further information about the 100 Watt DC-DC Converter, refer to *Installation and Reference for the 100 Watt DC-DC Converter Module* (part number 209132-A).

Features

The Business Policy Switch 2000 provides wire-speed switching that allows high-performance, low-cost connections to full-duplex and half-duplex 10/100/1000 Mb/s Ethernet local area networks (LANs). The Business Policy Switch provides the following features.

Policy-enabled networking

The Business Policy Switch 2000 enables system administrators to implement classes of service and assign priority levels to different types of traffic. Using the Nortel Networks Web-based management interface, you can configure policies that monitor the characteristics of traffic (for example, its source, destination, and protocol) and perform a controlling action on the traffic when certain user-defined characteristics are matched. The screens and field descriptions used for policy configuration are detailed in *Using Web-based Management for the Business Policy Switch 2000*.

Differentiated Services (DiffServ) is a network architecture that lets service providers and enterprise network environments offer varied levels of service for different types of data traffic. Instead of using the “best-effort” service model to ensure data delivery, DiffServ’s Quality of Service (QoS) lets you designate a specific level of performance on a packet-by-packet basis. If you have applications that require high performance and reliable service, such as voice and video over IP, you can use DiffServ to give preferential treatment to this data over other traffic.

The Business Policy Switch 2000 uses DiffServ to manage network traffic and resources. The information that is required to support DiffServ and multi-field classification is transferred using the Common Open Policy Services (COPS) protocol. COPS is a query and response protocol that exchanges policy information messages using the Transmission Control Protocol (TCP). All configuration can be performed using SNMP and the Web-based interface.

See “Configuring policy-enabled networks” on page 229 for more information.

Virtual Local Area Networks (VLANs)

In a traditional shared-media network, traffic generated by a station is transmitted to all other stations on the local segment. Therefore, for any given station on the shared Ethernet, the local segment is the *collision domain* because traffic on the segment has the potential to cause an Ethernet collision. The local segment is also the *broadcast domain* because any broadcast is sent to all stations on the local segment. Although Ethernet switches and bridges divide a network into smaller collision domains, they do not affect the broadcast domain. In simple terms, a virtual local area network provides a mechanism to fine-tune broadcast domains.

Your Business Policy Switch allows you to create three types of VLANs:

- IEEE 802.1Q port-based VLANs

  A port-based VLAN is a VLAN in which the ports are explicitly configured to be in the VLAN. When you create a port-based VLAN, you assign a Port VLAN Identifier (PVID) and specify which ports belong to the VLAN. The PVID is used to coordinate VLANs across multiple switches.

- Protocol-based VLANs

  A protocol-based VLAN is a VLAN in which you assign your switch ports as members of a broadcast domain, based on the protocol information within the packet. Protocol-based VLANs can localize broadcast traffic and assure that only the protocol-based VLAN ports are flooded with the specified protocol type packets.

- MAC source address (SA)-based VLANs

  A MAC SA- based VLAN is a VLAN in which you assign switch ports as members of a broadcast domain, based on the source MAC address information within the packet. MAC SA-based VLANs can be used to provide a MAC-level security scheme to organize and group different users.

Policy-based VLANs are determined by the information within the packet. A port can be a member of multiple policy-based VLANs. The order in which the rules for VLAN classification are applied are:

1. Is the packet tagged?
2. Does the packet belong in a MAC SA-based VLAN?
3. Does the packet belong in a protocol-based VLAN?

If none of the criteria applies, the packet belongs in the VLAN identified by the PVID of the ingress port. See Chapter 2, "Network configuration," for more information.

In addition, you configure VLANs as:

- Shared VLAN Learning (SVL) mode—Multiple VLANs use a single forwarding database.

  OR

- Independent VLAN Learning (IVL) mode—Each VLAN uses a unique forwarding database.

The IVL mode is only an option when using the Business Policy Switch 2000; you must use the SVL mode when operating a hybrid stack. Business Policy Switches support up to 64 VLANs (port-, protocol-, or MAC SA-based), including VLAN #1 which is always port-based. When a switch port is configured to be a member of a VLAN, it is added to a group of ports (workgroup) that belong to one broadcast domain. You can assign different ports (and therefore the devices attached to these ports) to different broadcast domains. This feature allows network flexibility because you can reassign VLANs to accommodate network moves, additions, and changes, eliminating the need to change physical cabling.

For more information about VLANs, see "IEEE 802.1Q VLAN workgroups" on page 69.

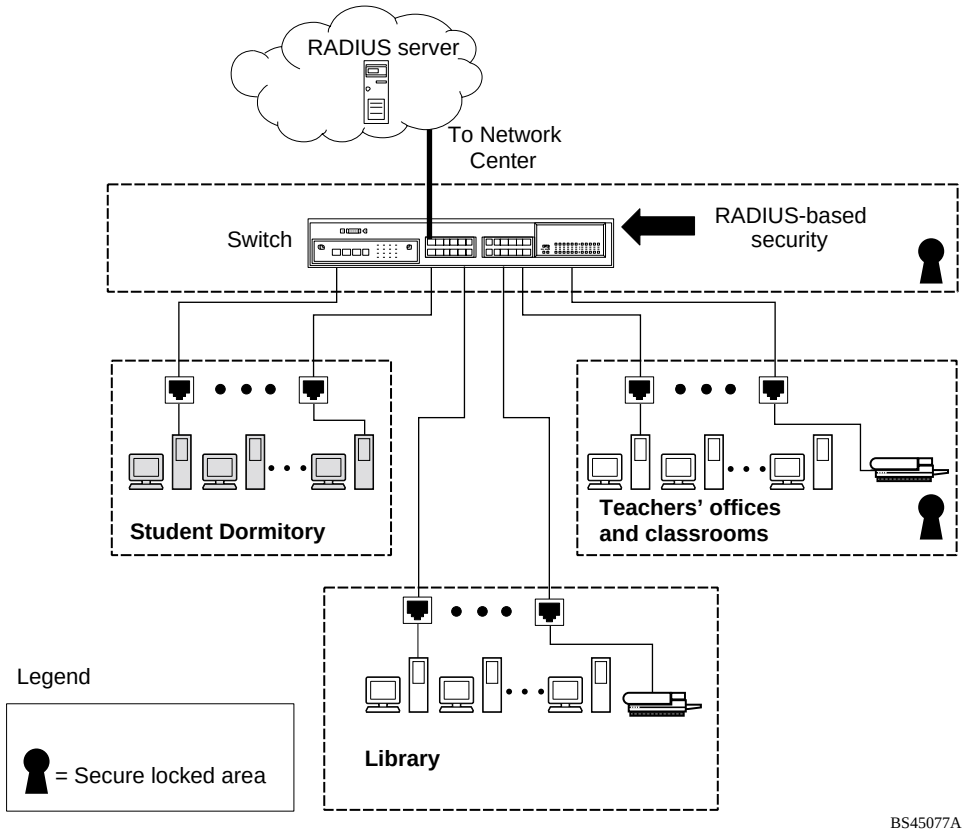
Security

The Business Policy Switch security features provide two levels of security for your local area network (LAN):

- RADIUS-based security—limits administrative access to the switch through user authentication
- MAC address-based security— limits access to the switch based on allowed source MAC addresses

Figure 6 shows a typical campus configuration using the Business Policy Switch security features. This example assumes that the switch, the teachers' offices and classrooms, and the library are physically secured. The student dormitory may (or may not be) physically secure.

Figure 6 Business Policy Switch 2000 security feature



In this configuration example, the following security measures are implemented:

- The switch
  - — RADIUS-based security is used to limit administrative access to the switch through user authentication (see "RADIUS-based network security" on page 43).
  - — MAC address-based security is used to allow up to 448 authorized stations (MAC addresses) access to one or more switch ports (see "MAC address-based security" on page 44).
  - — The switch is located in a locked closet, accessible only by authorized Technical Services personnel.

- Student dormitory

  Dormitory rooms are typically occupied by two students and have been prewired with two RJ-45 jacks. Only students who are authorized (as specified by the MAC address-based security feature) can access the switch on the secured ports.

- Teachers' offices and classrooms

  The PCs that are located in the teachers' offices and in the classrooms are assigned MAC address-based security that is specific for each classroom and office location. The security feature logically locks each wall jack to the specified station and prevents unauthorized access to the switch should someone attempt to connect a personal laptop PC into the wall jack. The printer is assigned as a single station and is allowed full bandwidth on that switch port.

  It is assumed that all PCs are password protected and that the classrooms and offices are physically secured.

- Library

  The wall jacks in the library are set up so that the PCs can be connected to any wall jack in the room. This arrangement allows the PCs to be moved anywhere in the room. The exception is the printer, which is assigned as a single station with full bandwidth to that port.

  It is assumed that all PCs are password protected and that access to the library is physically secured.

RADIUS-based network security

The RADIUS-based security feature allows you to set up network access control, using the RADIUS (Remote Authentication Dial-In User Services) security protocol. The RADIUS-based security feature uses the RADIUS protocol to authenticate local console and Telnet logins.

You will need to set up specific user accounts (user names and passwords, and Service-Type attributes) on your RADIUS server before the authentication process can be initiated. To provide each user with appropriate levels of access to the switch, set the following username attributes on your RADIUS server:

- Read-write access—Set the Service-Type field value to Administrative.
- Read-only access—Set the Service-Type field value to NAS-Prompt.

For detailed instructions to set up your RADIUS server, refer to your RADIUS server documentation.

For instructions to use the console interface (CI) to set up the RADIUS-based security feature, see Chapter 3, “Using the console interface,” on page 119.

MAC address-based security

The MAC address-based security feature allows you to set up network access control, based on source MAC addresses of authorized stations.

You can:

- Create a list of up to 448 MAC addresses and specify which addresses are authorized to connect to your switch or stack configuration. The 448 MAC addresses can be configured within a single standalone switch, or they can be distributed in any order among the units in a single stack configuration.
- Specify which of your switch ports each MAC address is allowed to access.

  The options for allowed port access include: NONE, ALL, and single or multiple ports that are specified in a list, for example, 1/1-4,1/6,2/9 (see “Port List Syntax” on page 149).
- Specify optional actions to be exercised by your switch if the software detects a security violation.

  The response can be to send a trap, turn on destination address (DA) filtering, disable the specific port, or any combination of these three options.

The MAC address-based security feature is based on Nortel Networks BaySecure™ LAN Access for Ethernet, a real-time security system that safeguards Ethernet networks from unauthorized surveillance and intrusion.

For instructions to use the console interface (CI) to set up the RADIUS-based security feature, see Chapter 3, “Using the console interface,” on page 119.

Flash memory storage

Switch software image storage

The Business Policy Switch uses flash memory to store the switch software image. The flash memory allows you to update the software image with a newer version without changing the switch hardware (see "Software Download screen" on page 219). An in-band connection between the switch and the TFTP load host is required to download the software image.

Configuration parameters storage

All configuration parameters are stored in flash memory. These parameters are updated every 10 seconds (if a change occurs) or whenever a reset command is executed.

Note: Do not power off the switch within 10 seconds of changing any configuration parameters. Powering down the switch within 10 seconds of changing configuration parameters can cause the changed configuration parameters to be lost.

MultiLink Trunking

The MultiLink Trunking feature allows you to group multiple ports, two to four together, when forming a link to another switch or server, thus increasing aggregate throughput of the interconnection between two devices, up to 800 Mb/s in full-duplex mode. The Business Policy Switch can be configured with up to six MultiLink Trunks. The trunk members can be configured within a single unit in the stack or distributed between any of the units within the stack configuration (distributed trunking).

For more information about the MultiLink Trunking feature, see "MultiLink Trunk Configuration Menu screen" on page 173.

Port mirroring (conversation steering)

The port mirroring feature (sometimes referred to as *conversation steering*) allows you to designate a single switch port as a traffic monitor for up to two specified ports or two media access control (MAC) addresses. You can specify *port-based* monitoring, where all traffic on specified ports is monitored, or *address-based* monitoring, where traffic between specified MAC addresses is monitored. You can attach a probe device (such as a Nortel Networks StackProbe, or equivalent) to the designated monitor port

For more information about the port mirroring feature, see "Port Mirroring Configuration screen" on page 180.

Autosensing and autonegotiation

The Business Policy Switches are autosensing and autonegotiating devices:

- The term *autosense* refers to a port's ability to *sense* the speed of an attached device.
- The term *autonegotiation* refers to a standardized protocol (IEEE 802.3u) that exists between two IEEE 802.3u-capable devices. Autonegotiation allows the switch to select the best of both speed and duplex modes.

Autosensing is used when the attached device is not capable of autonegotiation or is using a form of autonegotiation that is not compatible with the IEEE 802.3u autonegotiation standard. In this case, because it is not possible to sense the duplex mode of the attached device, the Business Policy Switch reverts to half-duplex mode.

When autonegotiation-capable devices are attached to the Business Policy Switch, the ports negotiate down from 100 Mb/s speed and full-duplex mode until the attached device acknowledges a supported speed and duplex mode.

For more information about autosensing and autonegotiation modes, see Chapter 5, "Troubleshooting," on page 233.

RFCs

For more information about networking concepts, protocols, and topologies, consult the following RFCs:

- RFC 1213 (MIB-II)
- RFC 1493 (Bridge MIB)
- RFC 1573 (Interface MIB)
- RFC 1643 (Ethernet MIB)
- RFC 1757 (RMON)
- RFC 1271 (RMON)
- RFC 1157 (SNMP)

Standards

The following IEEE Standards also contain information germane to the Business Policy Switch 2000:

- IEEE 802.1D (Standard for Spanning Tree Protocol)
- IEEE 802.3 (Ethernet)
- IEEE 802.1Q (VLAN Tagging)
- IEEE 802.1p (Prioritizing)

SNMP MIB support

The Business Policy Switch supports an SNMP agent with industry standard MIBs, as well as private MIB extensions, which ensures compatibility with existing network management tools. The switch supports the MIB-II (RFC 1213), Bridge MIB (RFC 1493), and the RMON MIB (RFC 1757), which provide access to detailed management statistics. With SNMP management, you can configure SNMP traps (on individual ports) to generate automatically for conditions such as an unauthorized access attempt or changes in a port's operating status. Table 5 lists supported SNMP MIBs.

Table 5 SNMP MIB support

Application	Standard MIBs	Proprietary MIBs
S5 Chassis MIB		s5cha127.mib
S5 Agent MIB		s5age140.mib
RMON	rfc1757.mib	
MLT		rcMLT
Common Open Policy Service (COPS) support	COPS Client MIB (IETF Draft)	
Policy Management	Policy Info Base	pib802, pibFramework, pibIp, pibNtn, mibntqos
SNMPv3 MIBs	RFCs 2571, 2572, 2573, 2574, 2575, 2576	
MIB2	rfc1213.mib	
IF-MIB	rfc2233.mib	
Etherlike MIB	rfc1643.mib	
Interface Extension MIB		s5ifx100.mib
Switch Bay Secure		s5sbs102.mib
IP Multicast (IGMP Snooping/Proxy)		rcVlanIgmp
System Log MIB		bnlog.mib
S5 Autotopology MIB		s5emt104.mib
VLAN		rcVlan
Entity MIB	RFC 2037	
Spanning Tree	RFC1493 Bridge MIB	

SNMP trap support

The Business Policy Switch supports an SNMP agent with industry standard SNMPv1 traps, as well as private SNMPv1 trap extensions (Table 6).

Table 6 Support SNMP traps

Trap name	Configurable	Sent when
RFC 1215 (industry standard):		
linkUp	Per port	A port's link state changes to up.
linkDown	Per port	A port's link state changes to down.
authenticationFailure	System wide	There is an SNMP authentication failure.
coldStart	Always on	The system is powered on.
warmStart	Always on	The system restarts due to a management reset.
s5CtrMIB (Nortel proprietary traps):		
s5CtrUnitUp	Always on	A unit is added to an operational stack.
s5CtrUnitDown	Always on	A unit is removed from an operational stack.
s5CtrHotSwap	Always on	A unit is hot-swapped in an operational stack.
s5CtrProblem	Always on	An assigned base unit fails.
s5EtrSbsMacAccessViolation	Always on	A MAC address violation is detected.

BootP automatic IP configuration/MAC address

The Business Policy Switch has a unique 48-bit hardware address, or MAC address, that is printed on a label on the back panel. You use this MAC address when you configure the network BootP server to recognize the Business Policy Switch BootP requests. A properly configured BootP server enables the switch to automatically learn its assigned IP address, subnet mask, IP address of the default router (default gateway), and software image file name.

For information on a stack MAC address, see "Stack MAC address" on page 62.

For more information and an example of a BootP configuration file, see Appendix H, "Sample BootP Configuration File," on page 299.

Configuration and switch management

The Business Policy Switch is shipped directly from the factory ready to operate in any 10BASE-T or 100BASE-TX standard network.

You must assign an IP address to the switch or stack, depending on the mode of operation. You can set both addresses by using the console port or BootP, which resides on the switch. You can manage the switch using:

- Console interface

  The console interface allows you to configure and manage the switch locally or remotely. Access the CI menus and screens locally through a console terminal attached to your Business Policy Switch, remotely through a dial-up modem connection, or in-band through a Telnet session.

  For information about the console interface, see Chapter 3, “Using the console interface,” on page 119.

- Web-based management

  You can manage the network from the World Wide Web. Access the Web-based graphical user interface (GUI) through the Embedded Web Server (EWS), the HTML-based browser located on your network. The GUI allows you to configure, monitor, and maintain your network through Web browsers. You can also download software using the Web.

  For information about Web-based management, refer to *Using Web-based Management for the Business Policy Switch 2000*.

- Java-based Device Manager

  Device Manager is a Java-based set of graphical network management applications used to configure and manage a Business Policy Switch. See *Reference for the Business Policy Switch 2000 Management Software Operations* for more information.

- Any generic SNMP-based network management software.

  You can use any generic SNMP-based network management software to configure and manage a Business Policy Switch.

- Nortel Networks Optivity® network management software

Optivity consists of views, most of which are maps that illustrate the interconnections between the segments, rings, and nodes of your network. The views allow you to quickly and easily analyze network performance and fault conditions on the individual segments and specific areas in your network. Through the views, Optivity can also alert you when a problem has occurred in a specific location.

For further information about Optivity, contact your Nortel Networks sales representative.

Multifield packet classification

Specify multifield (MF) packet classification based on header fields of data link, network, and transport layer protocols as you configure your policy criteria. Filters are populated with information needed to classify packets and determine the set of actions that need to be applied to classified packets.

See Chapter 4, “Configuring policy-enabled networks,” on page 229 for more information.

Chapter 2
Network configuration

Use Business Policy Switches to connect workstations, personal computers (PCs), and servers to each other by connecting these devices directly to the switch, through a shared media hub connected to the switch or by creating a virtual LAN (VLAN) through the switch.

Network configuration examples

This section provides four network configuration examples using Business Policy Switches. In these examples, the packet classification feature can be used to prioritize the traffic of the network to ensure uninterrupted traffic of critical applications.

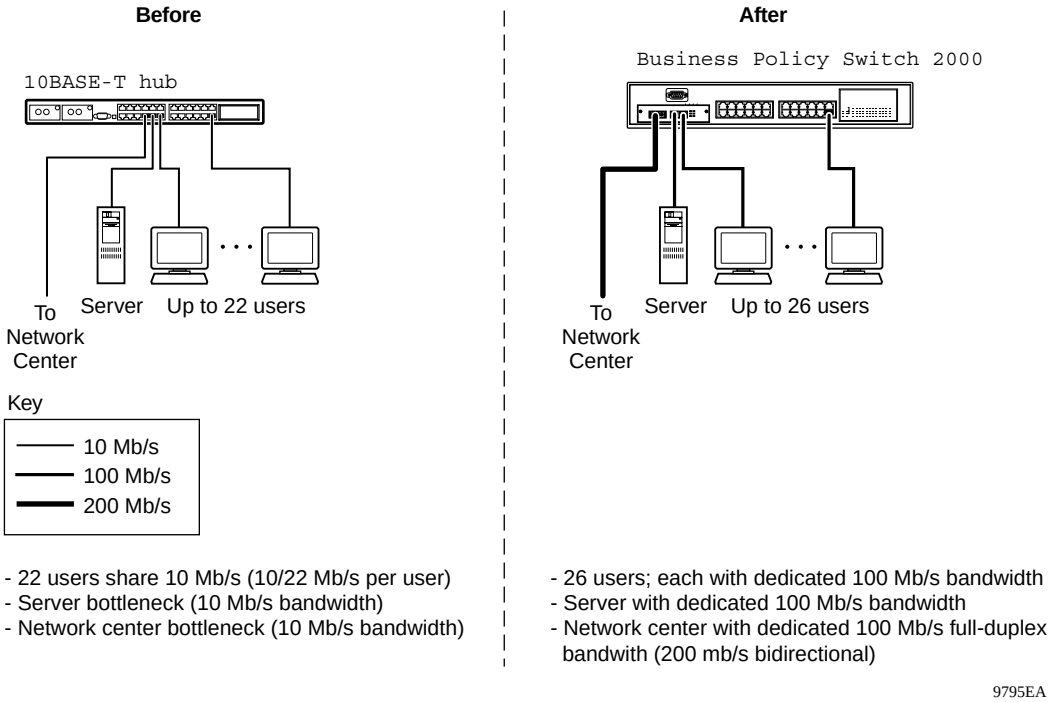
- Desktop switch application (this page)
- Segment switch application (page 54)
- High-density switched workgroup application (page 56)
- Fail-safe stack application (page 57)

Desktop switch application

Figure 7 shows a Business Policy Switch used as a desktop switch, where desktop workstations are connected directly to switch ports.

This configuration provides dedicated 100 Mb/s connections to the network center, the server, and as many as 26 users. This configuration uses the optional BPS2000-4TX MDA (10BASE-T/100BASE-TX MDA).

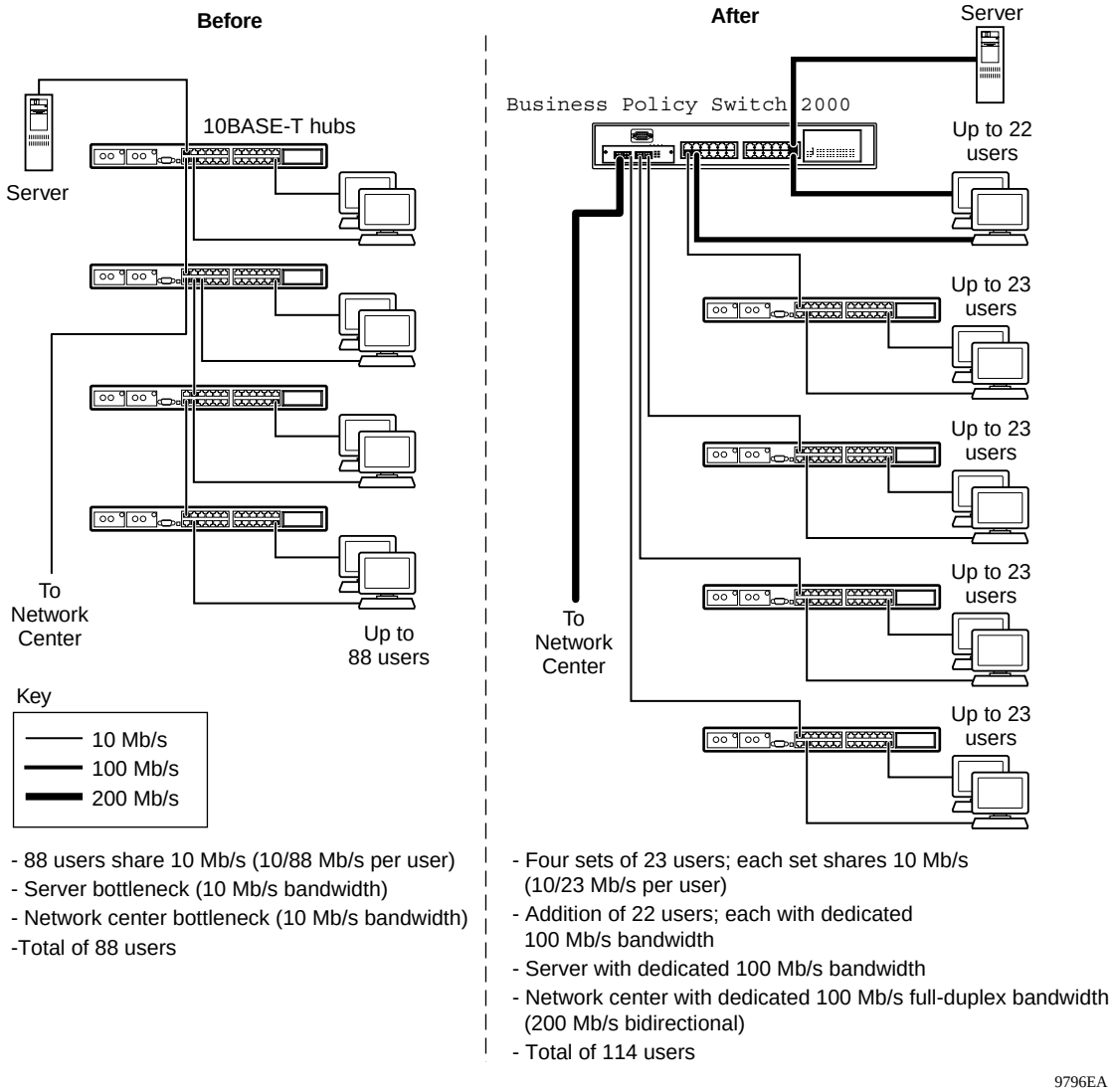
Figure 7 Business Policy Switch used as a desktop switch


Before
10BASE-T hub
To Network Center
Server
Up to 22 users
Key
10 Mb/s
100 Mb/s
200 Mb/s
- 22 users share 10 Mb/s (10/22 Mb/s per user)
- Server bottleneck (10 Mb/s bandwidth)
- Network center bottleneck (10 Mb/s bandwidth)
After
Business Policy Switch 2000
To Network Center
Server
Up to 26 users
- 26 users; each with dedicated 100 Mb/s bandwidth
- Server with dedicated 100 Mb/s bandwidth
- Network center with dedicated 100 Mb/s full-duplex bandwith (200 mb/s bidirectional)
9795EA

Segment switch application

Figure 8 shows a Business Policy Switch used as a segment switch to alleviate user contention for bandwidth and eliminate server and network bottlenecks. Before segmentation, 88 users had a total bandwidth of only 10 Mb/s available. After segmentation, 92 users have 40 Mb/s, four times the previous bandwidth, while adding 22 dedicated 100 Mb/s connections. This configuration can be extended to add more segments without degrading performance.

Figure 8 Business Policy Switch used as a segment switch



- 88 users share 10 Mb/s (10/88 Mb/s per user)
- Server bottleneck (10 Mb/s bandwidth)
- Network center bottleneck (10 Mb/s bandwidth)
-Total of 88 users

- Four sets of 23 users; each set shares 10 Mb/s (10/23 Mb/s per user)
- Addition of 22 users; each with dedicated 100 Mb/s bandwidth
- Server with dedicated 100 Mb/s bandwidth
- Network center with dedicated 100 Mb/s full-duplex bandwidth (200 Mb/s bidirectional)
- Total of 114 users

9796EA

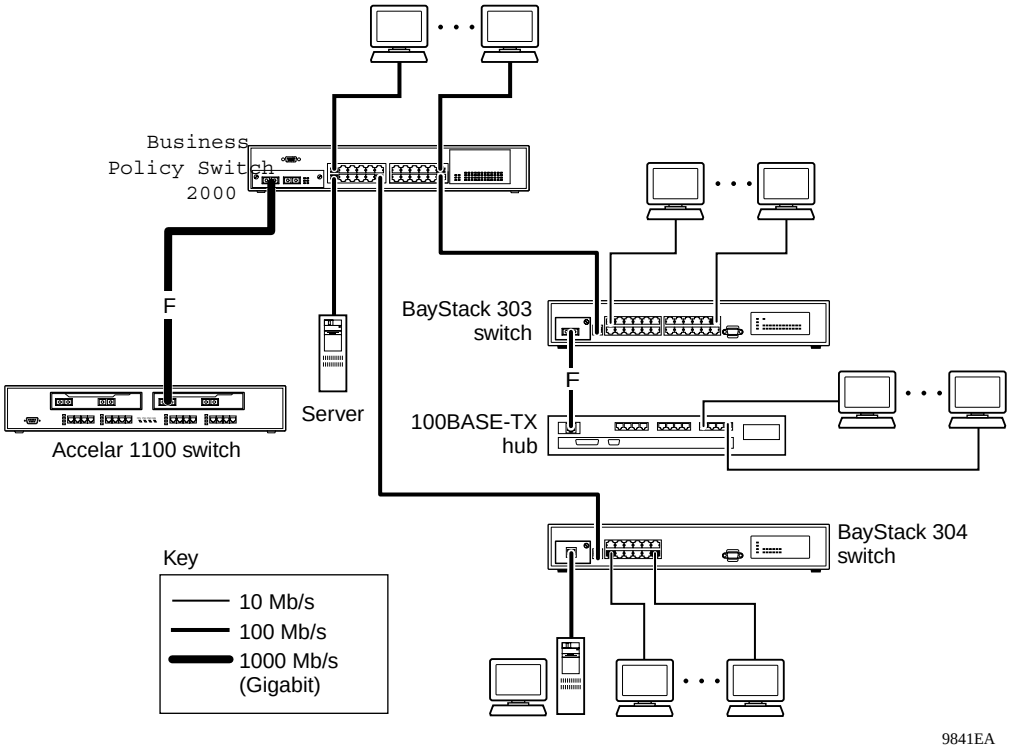
High-density switched workgroup application

Figure 9 shows an example of using a Business Policy Switch with a high-speed (gigabit) connection to a Nortel Networks Passport™ 1100 switch. BayStack 303 and BayStack 304 switches are also shown in this example of a high-density switched workgroup.

As shown in Figure 9, the Accelar 1100 switch is used as a backbone switch, connecting to the Business Policy Switch with an optional gigabit (1000BASE-SX) MDA for maximum bandwidth. The BayStack 303 and BayStack 304 switches have 100 Mb/s connections to the Business Policy Switch, a 100BASE-TX hub, and a 100 Mb/s server as well as 10 Mb/s connections to DTE (data terminal equipment).

See the Nortel Networks library Web page *support.baynetworks.com/library/tpubs/* for online documentation about the Nortel Networks Accelar 1100 switch and the BayStack 303 and BayStack 304 switches.

Figure 9 Configuring power workgroups and a shared media hub



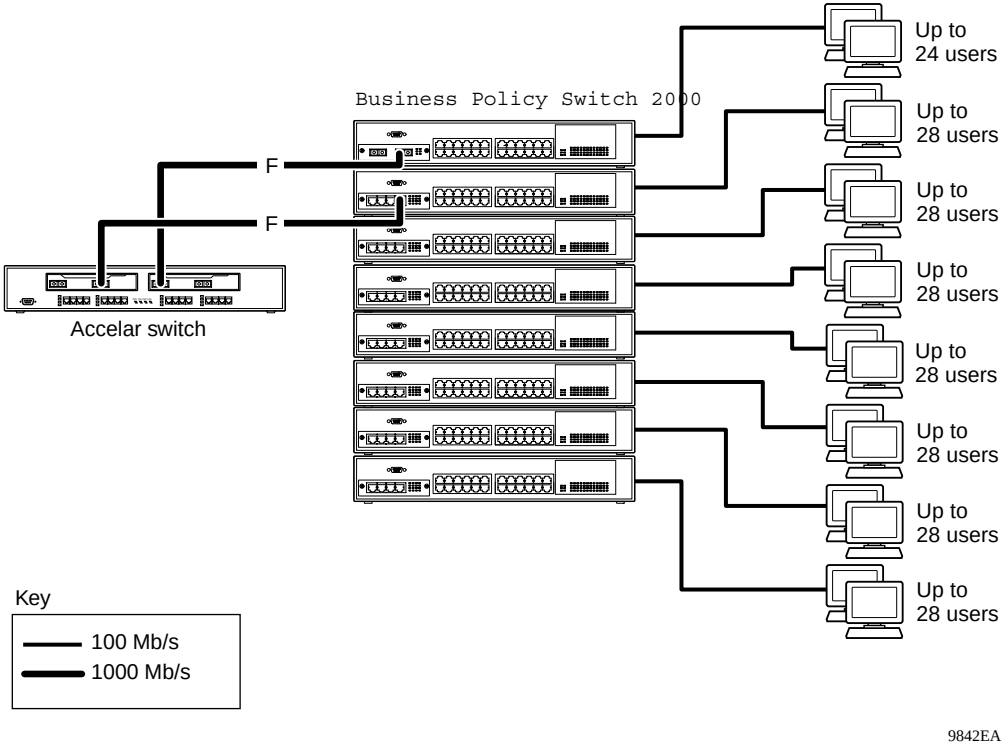
Fail-safe stack application

Figure 10 shows an example of eight Business Policy Switches that are stacked together as a single managed unit. If any single unit in the stack fails, the remaining stack remains operational, without interruption.

As shown in Figure 10, the Accelar 1100 switch is used as a backbone switch, connecting to the Business Policy Switch with an optional gigabit (1000BASE-SX) MDA for maximum bandwidth. This configuration uses optional BayStack 400-ST1 Cascade Modules to connect the switches in the fail-safe stack.

For an overview of the fail-safe stacking feature that is available for the Business Policy Switches, see “Business Policy Switch stack operation” on page 58.

Figure 10 Fail-safe stack example



Business Policy Switch stack operation

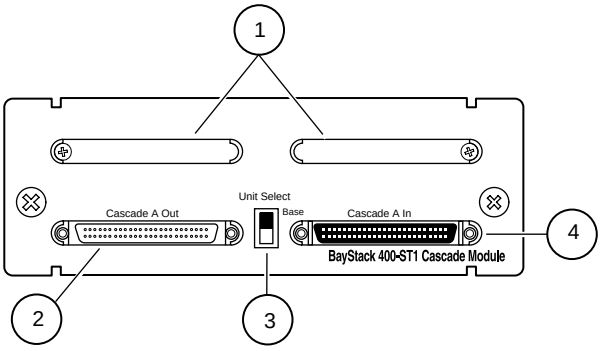
Business Policy Switches configured with Business Policy Switch software version 1.0 provide fail-safe stackability when you install the optional BayStack 400-ST1 Cascade Module. You can connect up to eight Business Policy Switches and BayStack 450 switches to provide uninterrupted connectivity for up to 224 ports (see “Fail-safe stack application” on page 57). The entire stack is manageable as a single unit. Installation instructions are provided with the BayStack 400-ST1 Cascade Module (see your Nortel Networks sales representative for ordering information).

Note: If you are implementing a mixed stack with the Business Policy Switch and BayStack 450 and BayStack 410 switches, refer to Appendix B, “Interoperability in a mixed stack configuration,” on page 247 for configuration and interoperability information.

BayStack 400-ST1 Cascade Module

The front-panel components of the BayStack 400-ST1 Cascade Module are shown in Figure 11. Component descriptions follow the figure.

Figure 11 BayStack 400-ST1 Cascade Module front-panel components



1 = Blank connectors (unused)
2 = Cascade A Out connector
3 = Unit Select switch
4 = Cascade A In connector

BS0031B

Cascade A Out connector

Provides an attachment point for connecting this unit to another unit via the cascade cable. A *return* cable from another unit’s Cascade A Out connector to this unit’s Cascade A In connector completes the stack connection (see the example shown in Figure 12).

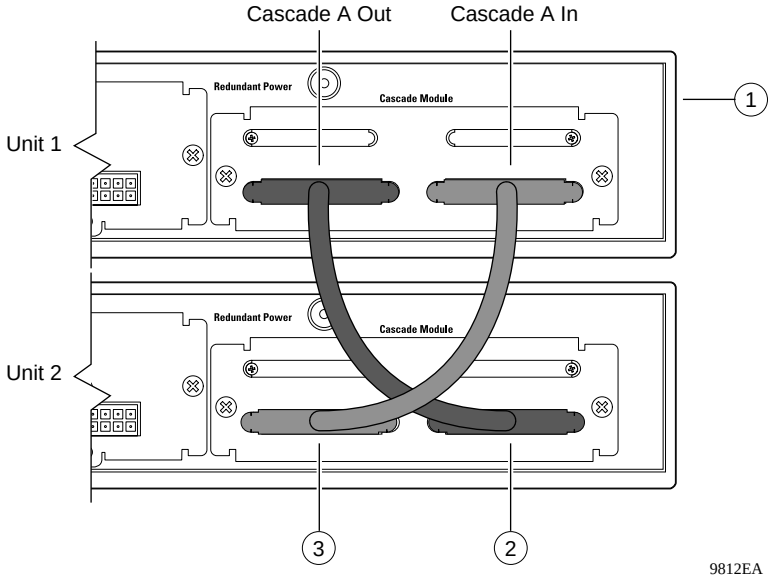
Unit Select switch

The Unit Select switch (up = Base) determines the *base unit* for the stack configuration (see "Base unit" on page 61). The Unit Select switch status is displayed on the Business Policy Switch LED display panel. When the Unit Select switch is in the Base (up) position, all other Unit Select switches in the stack configuration must be set to Off (down).

Cascade A In connector

Provides an attachment point for accepting a cascade cable connection from an adjacent unit in the stack. A *return* cable from this unit's Cascade A Out connector to the adjacent unit's Cascade A In connector completes the stack connection (see the example shown in Figure 12).

Figure 12 Connecting cascade cables



1	Base unit
2	303978-A cascade cable
3	303978-A cascade cable (used for return)

Base unit

Note: For stacking three or more units (maximum 8 units per stack), order the optional 1 meter (39.27 inch) cascade max-return cable (order number AL2018001).

The base unit is the unique stack unit that you configure with the Unit Select switch on the front panel of the BayStack 400-ST1 Cascade Module. One Business Policy Switch in the stack *must* be configured as the base unit; all other units in the stack *must* have their Unit Select switch set to Off (see "Unit Select switch" on page 60). You can assign any single Business Policy Switch as the base unit. If you are configuring a mixed stack, refer to Appendix B, "Interoperability in a mixed stack configuration," on page 247" for base unit instructions.

The physical ordering of all of the other units in the stack is determined by the position of the base unit within the stack. This is important for management applications that view the physical ordering of the units within the stack.

Some characteristics of the base unit are described in the following sections.

Initial installation

During the *initial installation* of the stack, the software automatically determines the physical order of all units in the stack according to the position of the base unit within the stack. Thereafter, the individual units maintain their original unit numbering, even if you change the position of one or more units in the stack (you can renumber the units using the Renumber Stack Units screen; see "Renumber Stack Units screen" on page 207).

For example, when you initially power up the stack, the base unit becomes unit 1 and the unit that the base unit connects to (via the Cascade A Out cable) becomes unit 2 (and the next unit is unit 3 and so on), until the maximum stack configuration (up to 8 units) is reached. If you change the base unit to another unit in the stack, the new base unit keeps its original unit number in the stack.

Stack MAC address

When the switch is participating in a stack configuration, a stack MAC address is automatically assigned during the stack initialization. The base unit's MAC address, with a software offset, is used for the stack MAC address.

For example, if the base unit's MAC address is 00-00-82-99-44-00, and the stack software offset is `1F`, then the stack MAC address becomes:

00-00-82-99-44-1F

If another unit in the stack is assigned as the base unit, the MAC address of the *new* base unit (with offset) now applies to the stack configuration. The original stack IP address still applies to the new base unit.

Temporary base unit

If an assigned base unit fails, the next unit in the stack order automatically becomes the new *temporary base unit*. This change is indicated by the base LED on the temporary base unit's LED display panel turning on (amber). For detailed information about the base LED, see Table 2, "Business Policy Switch 2000 LED descriptions," on page 33.

This automatic failover is a temporary safeguard only. If the stack configuration loses power, the temporary base unit will not power up as the base unit when power is restored. For this reason, you should always assign the temporary base unit as the base unit (set the Unit Select switch to Base) until the failed unit is repaired or replaced.

Note: If you do not reassign the temporary base unit as the new base unit, and the temporary base unit fails, the next unit directly downstream from this unit becomes the new temporary base unit. This process can continue until there are only two units left in the stack configuration.

Removing a unit from the stack

If a unit is removed from the stack (therefore operating in standalone mode), the following switch configuration settings revert back to the settings configured before the unit became a member of the stack:

- IP address
- Console password
- Telnet password
- SNMP community strings

Stack configurations

As shown in Figure 13, the cascade connectors and cables on the BayStack 400-ST1 Cascade Module front panel provide the ability to stack up to eight switches. With BPS-2000 MDAs installed in each switch, the stack can accommodate a maximum of 224 switch ports.

Because stack parameters are associated with the base unit (see "Base unit" on page 61), the physical stack order depends on the base unit's position and whether the stack is configured *stack up* or *stack down*.

Stack up configurations

In Figure 13, data flows from the base unit (unit 1) to the next switch, which is assigned as unit 2, and continues until the last switch in the stack is assigned as unit 8. The physical order of the switches is *from bottom to top* (unit 1 to unit 8).

Figure 13 Stack up configuration example

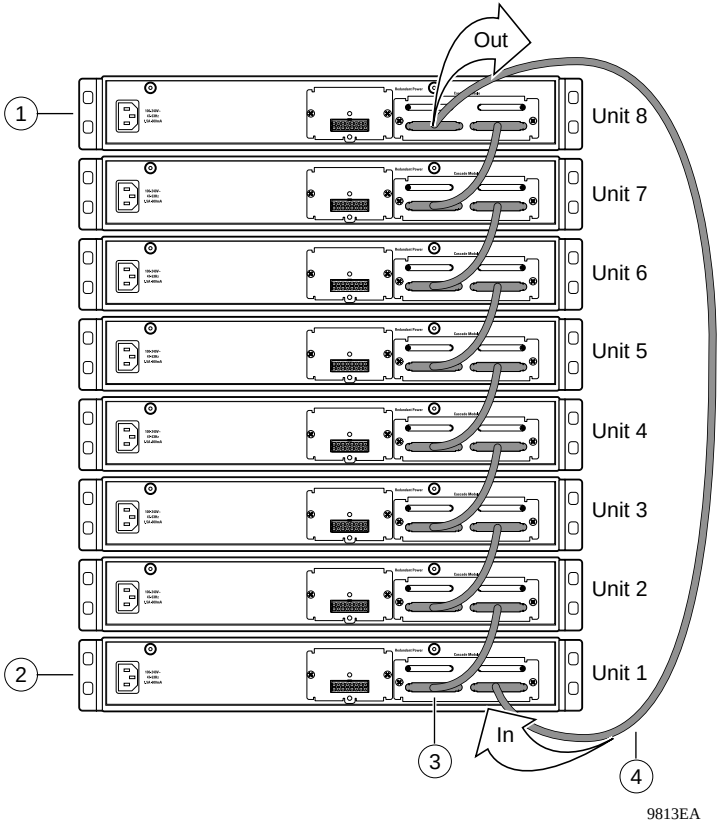


Table 7 describes the stack up configuration illustration references.

Table 7 Stack up configuration description

1	Last unit
2	Base unit
3	Cascade Cable (part number 303978-A)
4	Cascade Cable (part number 303979-A)

Stack down configurations

In Figure 14, data flows from the base unit (unit 1) to the next switch, which is assigned as unit 2, and continues until the last switch in the stack is assigned as unit 8. The physical order of the switches is *from top to bottom* (unit 1 to unit 8).

Figure 14 Stack down configuration example

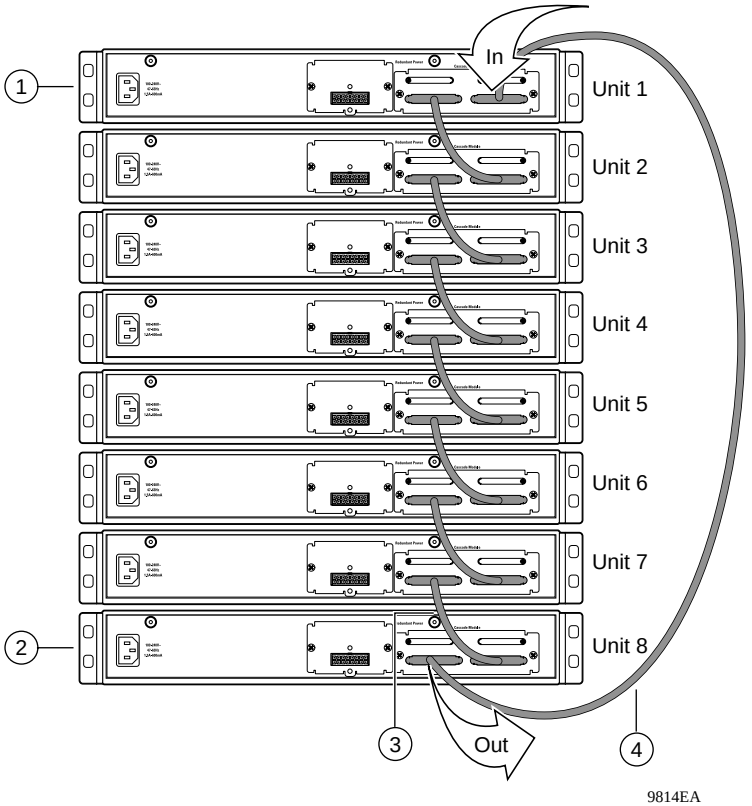


Table 8 describes the stack down configuration illustration references.

Table 8 Stack down configuration description

1	Base unit
2	Last unit
3	Cascade cable (part number 303978-A)
4	Cascade max-return cable (part number 303979-A)

Certain network management station (NMS) applications assume a stack down configuration for the graphical user interface (GUI) that represents the stack (see Figure 14). For this reason, Nortel Networks recommends that you always configure the top unit in the stack as the base unit.

In any stack configuration, the following applies:

- When you apply power to the stack, the base unit initializes and the entire stack powers up as a single logical unit within 45 seconds.
- You can attach an RS-232 communications cable to the console port of any switch in the stack.
- You can downline upgrade the entire stack from any switch in the stack from the console interface, a Telnet session, the Web-based management interface, or any generic SNMP-based network management software.
- You can access and manage the stack using a Telnet connection, the Web-based management interface, or any generic SNMP management tool through any switch port that is part of the stack configuration.
- When stacking three or more switches, use the longer (1-meter) cascade max-return cable (part number 303979-A) to complete the link from the last unit in the stack to the base unit.

Redundant cascade stacking feature

Business Policy Switches allow you to connect up to 8 units into a redundant cascade stack. If any single unit fails or if a cable is accidently disconnected, other units in the stack remain operational, without interruption.

Figure 15 shows an example of how a stack configuration reacts to a failed or powered-down unit in the stack configuration:

1. As shown in Figure 15, unit 3 becomes nonoperational.

   This result can be due to a failed unit or simply because the unit was powered down.

2. Unit 2 and unit 4, directly upstream and downstream from unit 3, sense the loss of link signals from unit 3.

   a. Units 2 and 4 automatically loop their internal stack signals (A and B).

   b. The Cas Up LED for unit 2 and the Cas Dwn LED for unit 4 turn on (amber) to indicate that the stack signals are looped.

3. The remaining stack units remain connected.

Although the example shown in Figure 15 shows a failed unit causing the stack to loop signals at the points of failure (A and B), the system reacts the same way if a cable is removed.

Figure 15 Redundant cascade stacking feature

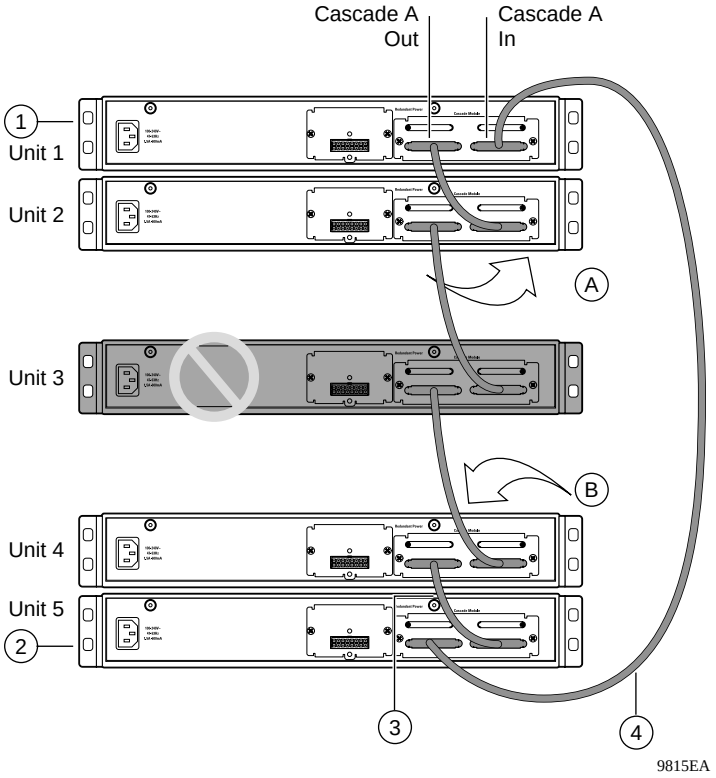


Table 9 describes the redundant cascade stacking illustration references.

Table 9 Redundant cascade stacking descriptions

1	Base unit
2	Last unit
3	Cascade cable (part number 303978-A)
4	Cascade max-return cable (part number 303979-A)

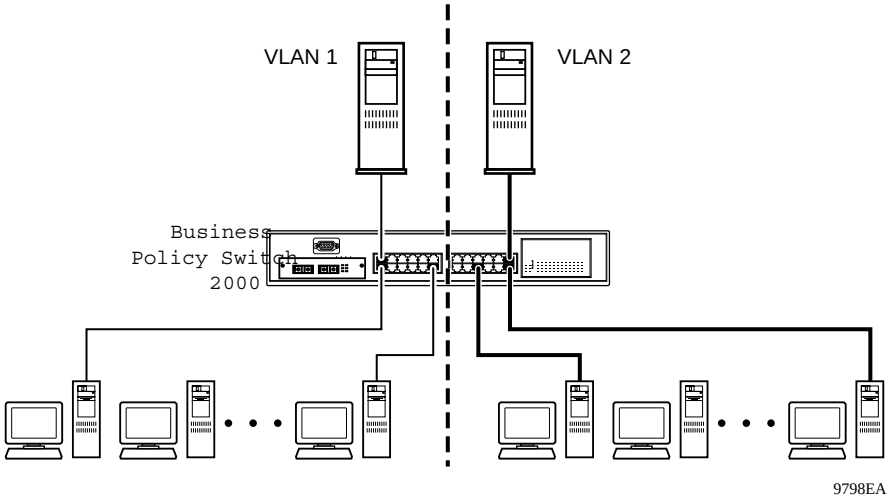
IEEE 802.1Q VLAN workgroups

Business Policy Switches support up to 64 port-based VLANs with IEEE 802.1Q tagging available per port. Ports are grouped into broadcast domains by assigning them to the same VLAN. Frames received in one VLAN can only be forwarded within that VLAN, and multicast frames and unknown unicast frames are flooded only to ports in the same VLAN.

Setting up virtual LANs (VLANs) is a way to segment networks to increase network capacity and performance without changing the physical network topology (Figure 16). With network segmentation, each switch port connects to a segment that is a single broadcast domain. When a switch port is configured to be a member of a VLAN, it is added to a group of ports (workgroup) that belong to one broadcast domain.

The Business Policy Switch allows you to assign ports to VLANs using the console, Telnet, Web-based management, or an appropriate SNMP-based application. You can assign different ports (and therefore the devices attached to these ports) to different broadcast domains. This feature allows network flexibility because you can reassign VLANs to accommodate network moves, additions, and changes, eliminating the need to change physical cabling.

Figure 16 Port-based VLAN example



IEEE 802.1Q tagging

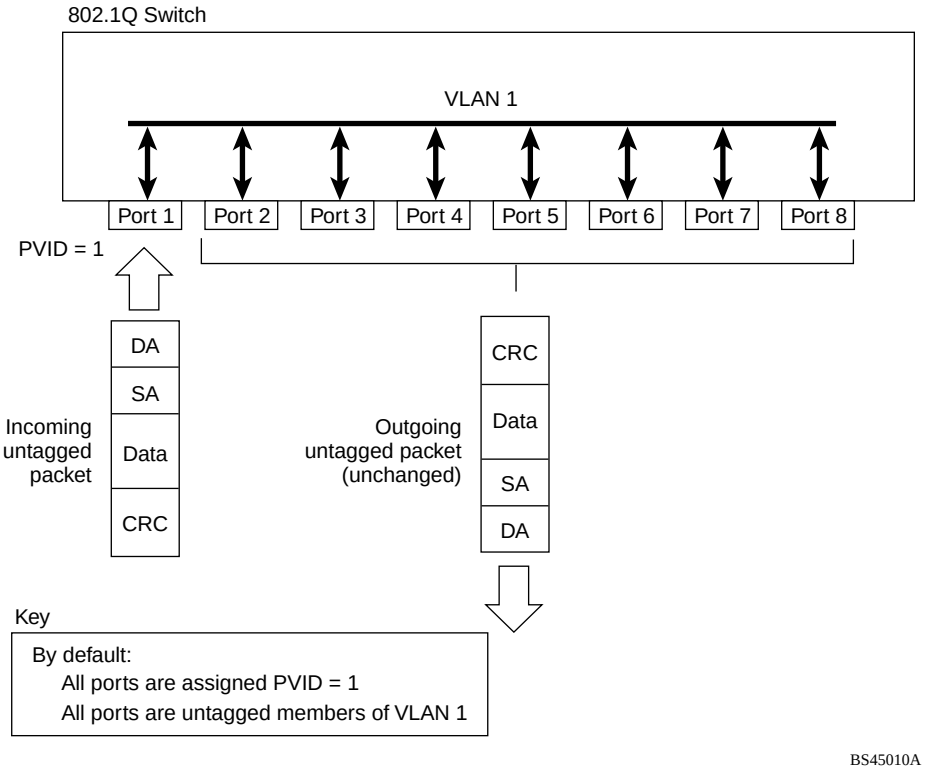
Business Policy Switches operate in accordance with the IEEE 802.1Q tagging rules. Important terms used with the 802.1Q tagging feature are:

- VLAN identifier (VID)—the 12-bit portion of the VLAN tag in the frame header that identifies an explicit VLAN. When other types of VLANs are enabled, this default value can be overridden by the values enabled in the Web-based management interface. Refer to *Using Web-based Management for the Business Policy Switch 2000*.
- Port VLAN identifier (PVID)—a classification mechanism that associates a port with a specific VLAN. For example, a port with a PVID of 3 (PVID =3) assigns all untagged frames received on this port to VLAN 3.
- Tagged frame— the 32-bit field (VLAN tag) in the frame header that identifies the frame as belonging to a specific VLAN. Untagged frames are marked (tagged) with this classification as they leave the switch through a port that is configured as a tagged port.
- Untagged frame— a frame that does not carry any VLAN tagging information in the frame header.
- VLAN port members— a set of ports that form a broadcast domain for a specific VLAN. A port can be a member of one or more VLANs.
- Untagged member—a port that has been configured as an untagged member of a specific VLAN. When an untagged frame exits the switch through an untagged member port, the frame header remains unchanged. When a tagged frame exits the switch through an untagged member port, the tag is stripped and the tagged frame is changed to an untagged frame.
- Tagged member—a port that has been configured as a member of a specific VLAN. When an untagged frame exits the switch through a tagged member port, the frame header is modified to include the 32-bit tag associated with the PVID. When a tagged frame exits the switch through a tagged member port, the frame header remains unchanged (original VID remains).
- User priority—a three-bit field in the header of a tagged frame. The field is interpreted as a binary number, therefore has a value of 0 - 7. This field allows the tagged frame to carry the user-priority across bridged LANs where the individual LAN segments may be unable to signal priority information.
- Port priority—the priority level assigned to *untagged* frames received on a port. This value becomes the user priority for the frame. *Tagged* packets get their user priority from the value contained in the 802.1Q frame header.

- Unregistered packet—a tagged frame that contains a VID where the receiving port is not a member of that VLAN.
- Filtering database identifier (FID)—the specific filtering/forwarding database within the Business Policy Switch that is assigned to each VLAN. The current version of software assigns *all VLANs* to the same FID when it is running in the Hybrid Operational mode. This process is referred to as Shared VLAN Learning in the IEEE 802.1Q specification. In the Pure BPS 2000 operational mode, a VLAN may either share its filtering database with other VLANs (shared VLAN learning or SVL) or have its own filtering database (independent VLAN learning or IVL).

The default configuration settings for Business Policy Switches have all ports set as untagged members of VLAN 1 with all ports configured as PVID = 1. Every VLAN is assigned a unique VLAN identifier (VID) that distinguishes it from all other VLANs. In the default configuration example shown in Figure 17, all incoming packets are assigned to VLAN 1 by the default port VLAN identifier (PVID =1). Untagged packets enter and leave the switch unchanged.

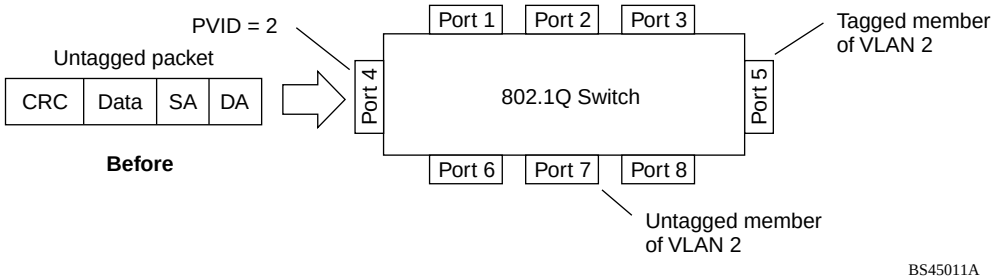
Figure 17 Default VLAN settings



When you configure VLANs, you configure the switch ports as *tagged* or *untagged* members of specific VLANs (see Figure through Figure 21).

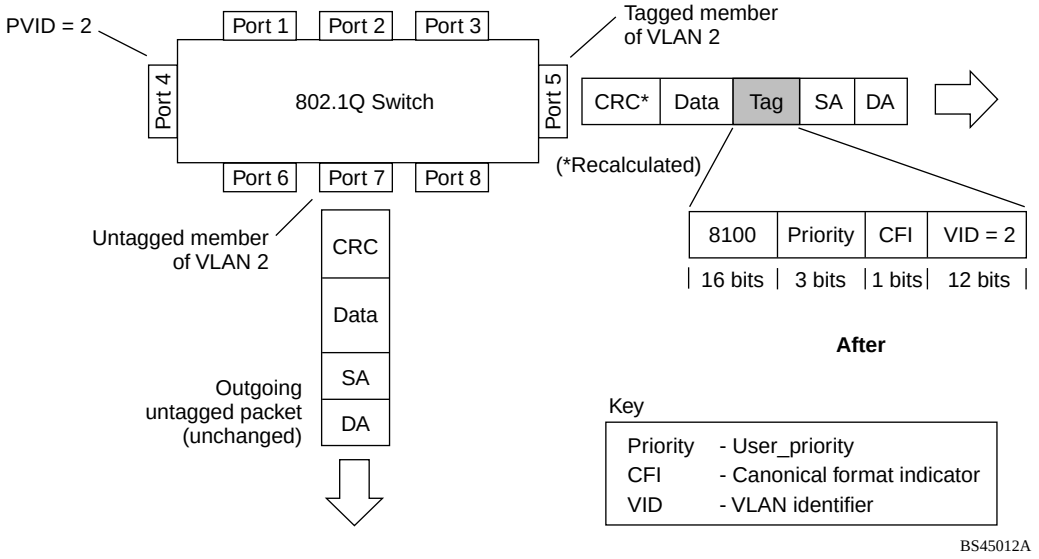
In Figure 17, untagged incoming packets are assigned directly to VLAN 2 (PVID = 2). Port 5 is configured as a *tagged* member of VLAN 2, and port 7 is configured as an *untagged* member of VLAN 2.

Figure 18 Port-based VLAN assignment



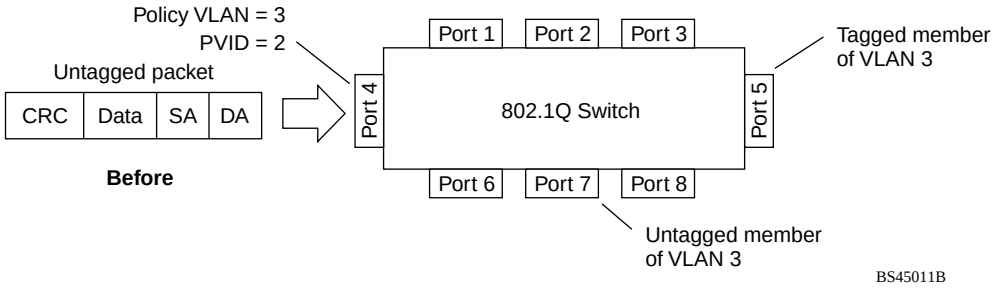
As shown in Figure 19, the untagged packet is marked (tagged) as it leaves the switch through port 5, which is configured as a tagged member of VLAN 2. The untagged packet remains unchanged as it leaves the switch through port 7, which is configured as an untagged member of VLAN 2.

Figure 19 802.1Q tagging (after port-based VLAN assignment)



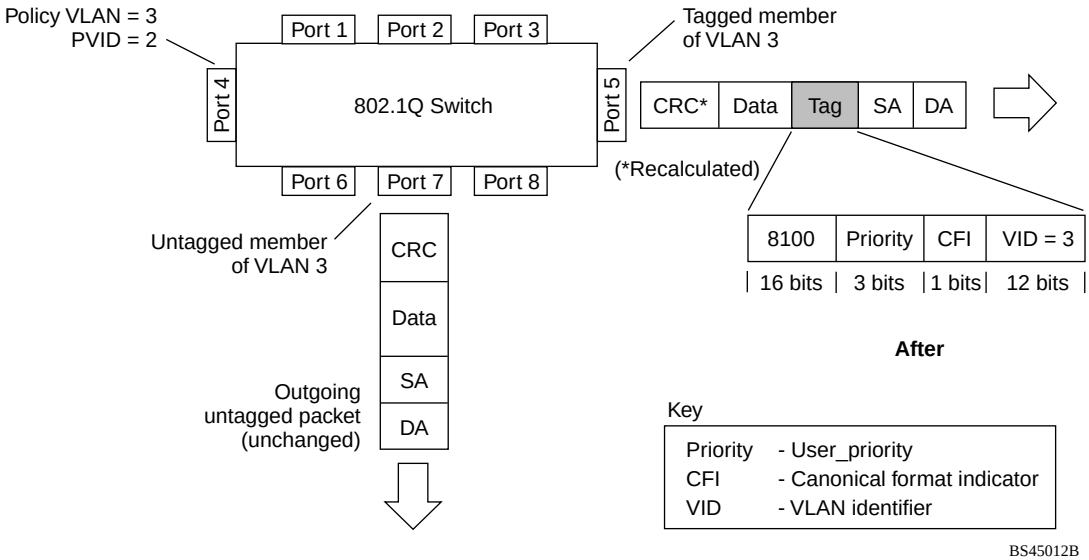
In Figure 20, untagged incoming packets are assigned to VLAN 3 (policy VLAN = 3, PVID = 2). Port 5 is configured as a *tagged* member of VLAN 3, and port 7 is configured as an *untagged* member of VLAN 3.

Figure 20 Policy-based VLAN assignment



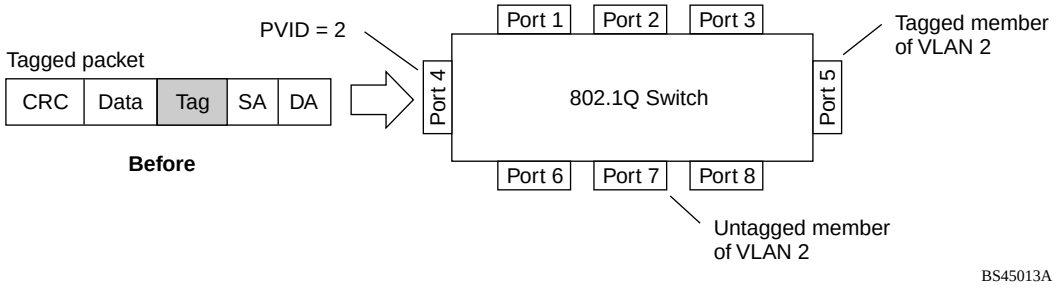
As shown in Figure 21,the untagged packet is marked (tagged) as it leaves the switch through port 5, which is configured as a tagged member of VLAN 3. The untagged packet remains unchanged as it leaves the switch through port 7, which is configured as an untagged member of VLAN 3.

Figure 21 802.1Q tagging (after policy-based VLAN assignment)



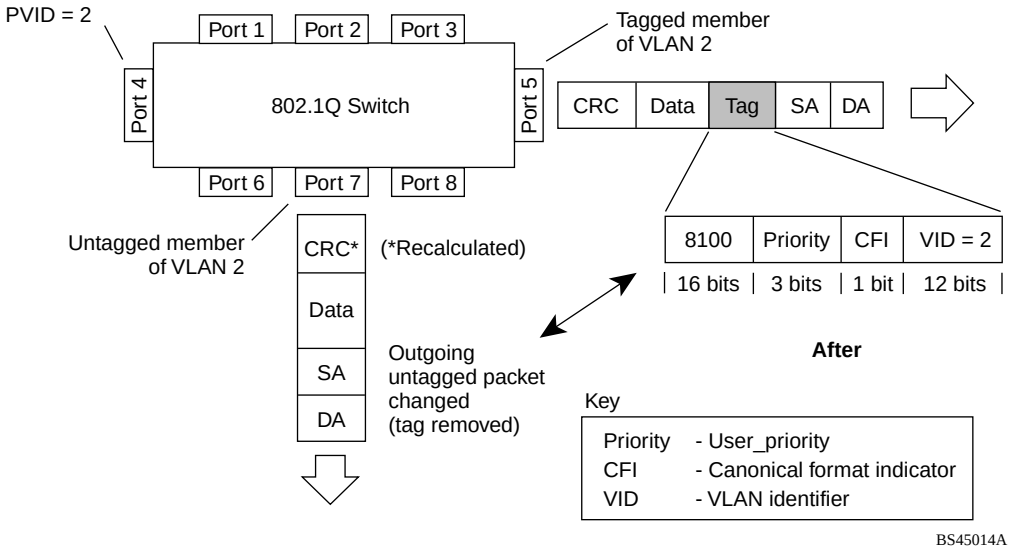
In Figure 22, tagged incoming packets are assigned directly to VLAN 2 because of the tag assignment in the packet. Port 5 is configured as a *tagged* member of VLAN 2, and port 7 is configured as an *untagged* member of VLAN 2.

Figure 22 802.1Q tag assignment



As shown in Figure 23, the tagged packet remains unchanged as it leaves the switch through port 5, which is configured as a tagged member of VLAN 2. However, the tagged packet is stripped (untagged) as it leaves the switch through port 7, which is configured as an untagged member of VLAN 2.

Figure 23 802.1Q tagging (after 802.1Q tag assignment)



VLANs spanning multiple switches

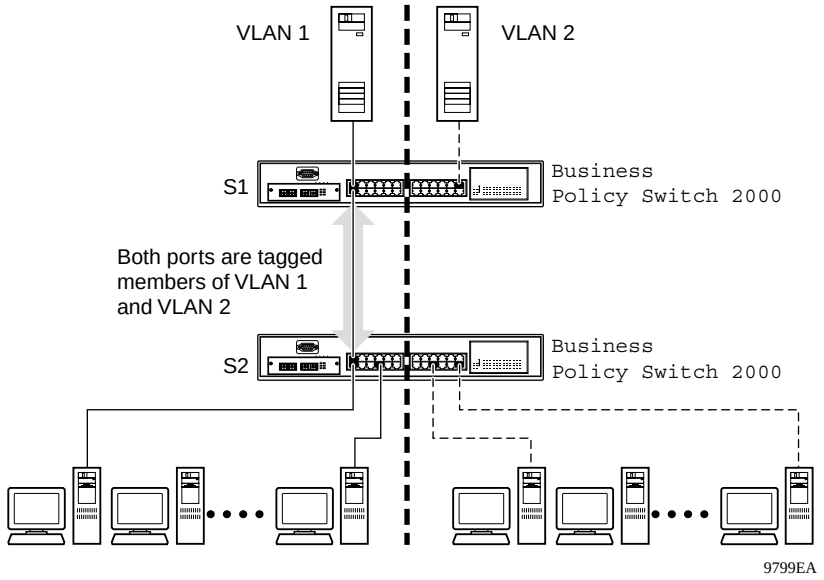
You can use VLANs to segment a network within a switch. When you connect multiple switches, it is possible to connect users of one VLAN with users of that same VLAN in another switch. However, the configuration guidelines depend on whether both switches support 802.1Q tagging.

With 802.1Q tagging enabled on a port for a VLAN, all frames leaving the port for that VLAN are *marked* as belonging to that specific VLAN. You can assign specific switch ports as members of one or more VLANs that span multiple switches, without interfering with the Spanning Tree Protocol.

VLANs spanning multiple 802.1Q tagged switches

Figure 24 shows VLANs spanning two Business Policy Switches. The 802.1Q tagging is enabled on S1, port 2 and on S2, port 1 for VLAN 1 and VLAN 2. Both ports are tagged members of VLAN 1 and VLAN 2.

Figure 24 VLANs spanning multiple 802.1Q tagged switches



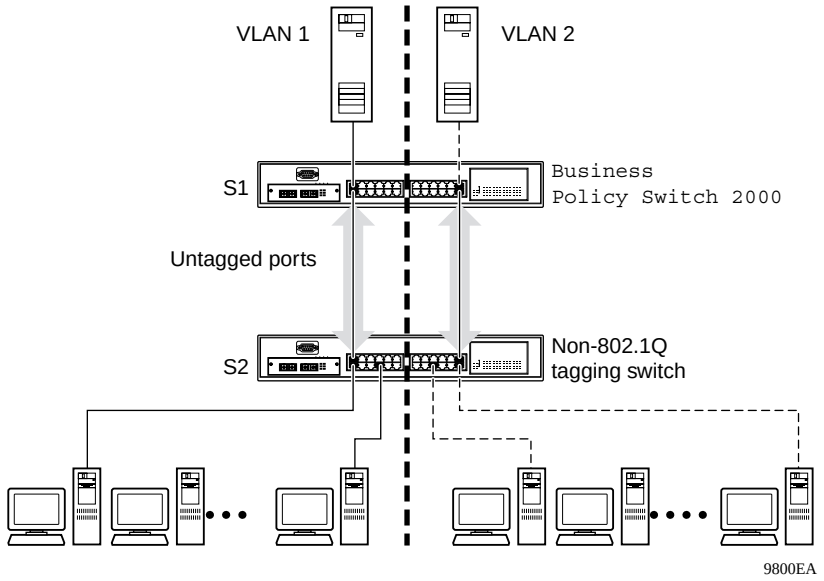
Because there is only one link between the two switches, the Spanning Tree Protocol (STP) treats this configuration as any other switch-to-switch connection. For this configuration to work properly, both switches must support the 802.1Q tagging protocol.

VLANS spanning multiple untagged switches

Figure 25 shows VLANs spanning multiple untagged switches. In this configuration, Switch S2 does not support 802.1Q tagging and you must use a single switch port on each switch for each VLAN.

For this configuration to work properly, you must set spanning tree participation to Disabled (the STP is not supported across multiple LANs).

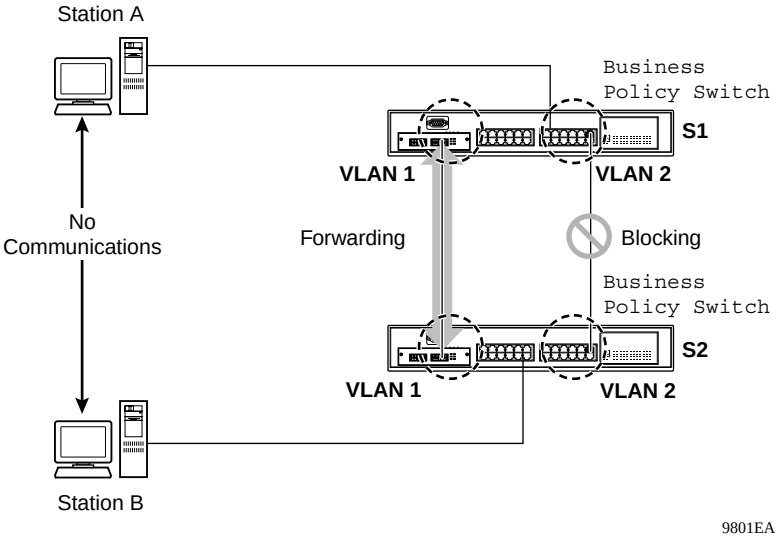
Figure 25 VLANs spanning multiple untagged switches



When the STP is enabled on these switches, only one link between each pair of switches will be forwarding traffic. Because each port belongs to only one VLAN at a time, connectivity on the other VLAN is lost. Exercise care when configuring the switches to ensure that the VLAN configuration does not conflict with spanning tree configuration.

To connect multiple VLANs across switches with redundant links, you must disable the STP on all participating switch ports. Figure 26 shows possible consequences of enabling the STP when using VLANs between untagged (non-802.1Q tagged) switches.

Figure 26 Possible problems with VLANs and Spanning Tree Protocol



As shown in Figure 26, with STP enabled, only one connection between Switch S1 and Switch S2 is forwarding at any time. Communications failure occurs between VLAN 2 of S1 and VLAN 2 of S2, blocking communications between Stations A and B.

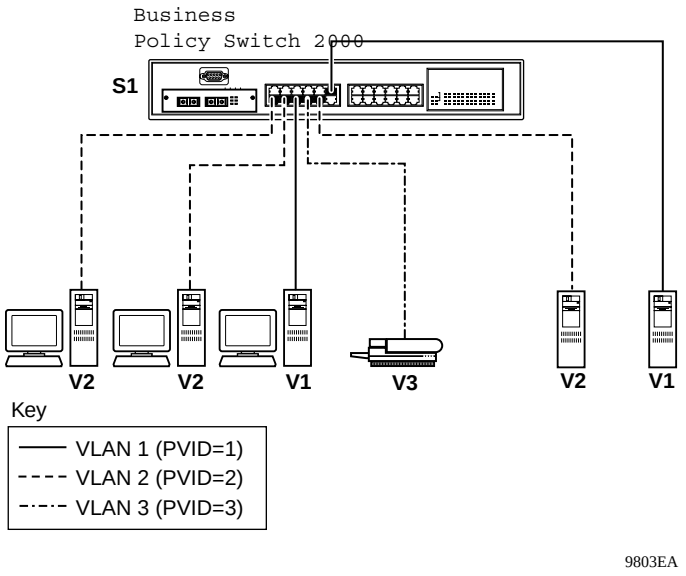
The STP selects the link connecting VLAN 1 on Switches S1 and S2 as the forwarding link based on port speed, duplex-mode, and port priority. Because the other link connecting VLAN 2 is in Blocking mode, stations on VLAN 2 in Switch S1 cannot communicate with stations in VLAN 2 on Switch S2. With multiple links only one link will be forwarding.

Shared servers

Business Policy Switches allow ports to exist in multiple VLANs for shared resources, such as servers, printers, and switch-to-switch connections. It is also possible to have resources exist in multiple VLANs on one switch as shown in Figure 27.

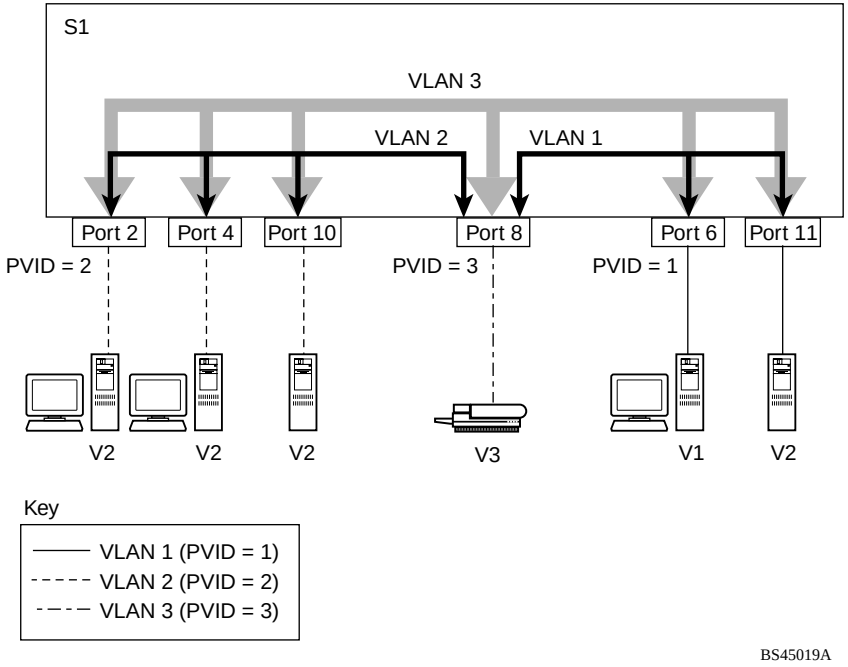
In this example, clients on different broadcast domains share resources. The broadcasts from ports configured in VLAN 3 can be seen by all VLAN port members of VLAN 3.

Figure 27 Multiple VLANs sharing resources



In the above configuration, all of the switch ports are set to participate as VLAN port members. This arrangement allows the switch to establish the appropriate broadcast domains within the switch (Figure 28).

Figure 28 VLAN broadcast domains within the switch



For example, to create a broadcast domain for each VLAN shown in Figure 28, configure each VLAN with a port membership, and each port with the appropriate PVID/VLAN association:

- Ports 8, 6, and 11 are untagged members of VLAN 1.
- The PVID/VLAN association for ports 6 and 11 is: PVID = 1.
- Ports 2, 4, 10, and 8 are untagged members of VLAN 2.
- The PVID/VLAN association for ports 2, 4, and 10 is: PVID = 2.
- Ports 2, 4, 10, 8, 6, and 11 are untagged members of VLAN 3.
- The PVID/VLAN association for port 8 is: PVID = 3.

The following steps show how to use the VLAN configuration screens to configure the VLAN 3 broadcast domain shown in Figure 28.

To configure the VLAN port membership for VLAN 1:

1. Select Switch Configuration from the Business Policy Switch Main Menu (or press w).
2. From the Switch Configuration Menu, select VLAN Configuration (or press v).
3. From the VLAN Configuration Menu select VLAN Configuration (or press v).

   The default VLAN Configuration screen opens (Figure 29):

Figure 29 Default VLAN Configuration screen example

```
                              VLAN Configuration


Create VLAN:      [   1 ]                Vlan Type:          [ Port-Based ]
Delete VLAN:      [     ]                Protocol Id (PID):  [   None     ]
VLAN Name:        [ Default VLAN ]       User-Defined PID:   [ 0x0000     ]
Management VLAN:  [ Yes ] Now: 1         VLAN State:         [ Active     ]
IVL/SVL:          [ IVL ]                Subnet Addr:        [ 0.0.0.0 ]
                                         Subnet Mask:        [ 0.0.0.0 ]

                     Port Membership
           1-6       7-12      13-18      19-24
           ------    ------    ------     ------

 Unit #1   UUUUUU    UUUUUU    UUUUUU     UUUUUU


KEY: T = Tagged Port Member, U = Untagged Port Member, - = Not a Member of
VLAN
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Me
```

The VLAN Configuration screen settings shown in Figure 29 are default settings with all switch ports classified as *untagged* members of VLAN 1.

Figure 30 shows the VLAN Configuration screen after it is configured to support the VLAN 3 broadcast domain shown in Figure 28 (VLAN Name is optional).

Ports 2, 4, 6, 8, 10, and 11 are now untagged members of VLAN 3 as shown in Figure 28 on page 80.

Figure 30 VLAN Configuration screen example

```
                              VLAN Configuration


Create VLAN:      [   3 ]                Vlan Type:          [ Port-Based ]
Delete VLAN:      [     ]                Protocol Id (PID):  [   None     ]
VLAN Name:        [test VLAN ]           User-Defined PID:   [ 0x0000     ]
Management VLAN:  [ Yes ] Now: 1         VLAN State:         [ Active     ]
IVL/SVL:          [ IVL ]                Subnet Addr:        [ 0.0.0.0 ]
                                         Subnet Mask:        [ 0.0.0.0 ]

                       Port Membership
            1-6        7-12      13-18      19-24
            -------    ------    ------     ------

 Unit #1    -U-U-U    -U-UU     ------      ------


KEY: T = Tagged Port Member, U = Untagged Port Member, - = Not a Member of
VLAN
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Me
```

To configure the PVID (port VLAN identifier) for port 8:

1. From the VLAN Configuration screen, press [Ctrl]-R to return to the VLAN Configuration Menu.
2. From the VLAN Configuration Menu, select VLAN Port Configuration (or press c).

   The default VLAN Port Configuration screen opens (Figure 31).

   The VLAN Port Configuration screen settings shown in Figure 31 are default settings.

Figure 31 Default VLAN Port Configuration screen example

```
                        VLAN Port Configuration


                Unit:                          [  1  ]
                Port:                          [  1  ]
                Filter Tagged Frames:          [ No  ]
                Filter Untagged Frames:        [ No  ]
                Filter Unregistered Frames:    [ No  ]
                Port Name:                     [     ]
                PVID:                          [  1  ]
                Port Priority:                 [ 0 ]
                Tagging:                       [ Untagged Access ]




Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 32 shows the VLAN Port Configuration screen after it is configured to support the PVID assignment for port 8, as shown in Figure 28 (Port Name is optional).

The PVID/VLAN association for VLAN 3 is now PVID = 3.

Figure 32 VLAN Port Configuration screen example

```
                          VLAN Port Configuration


                Unit:                          [  1  ]
                Port:                          [  8  ]
                Filter Tagged Frames:          [ No  ]
                Filter Untagged Frames:        [ No  ]
                Filter Unregistered Frames:    [ No  ]
                Port Name:                     [ Student port ]
                PVID:                          [  3  ]
                Port Priority:                 [  0  ]
                Tagging:                       [Untagged Access]


Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

VLAN workgroup summary

This section summarizes the VLAN workgroup examples discussed in the previous sections of this chapter.

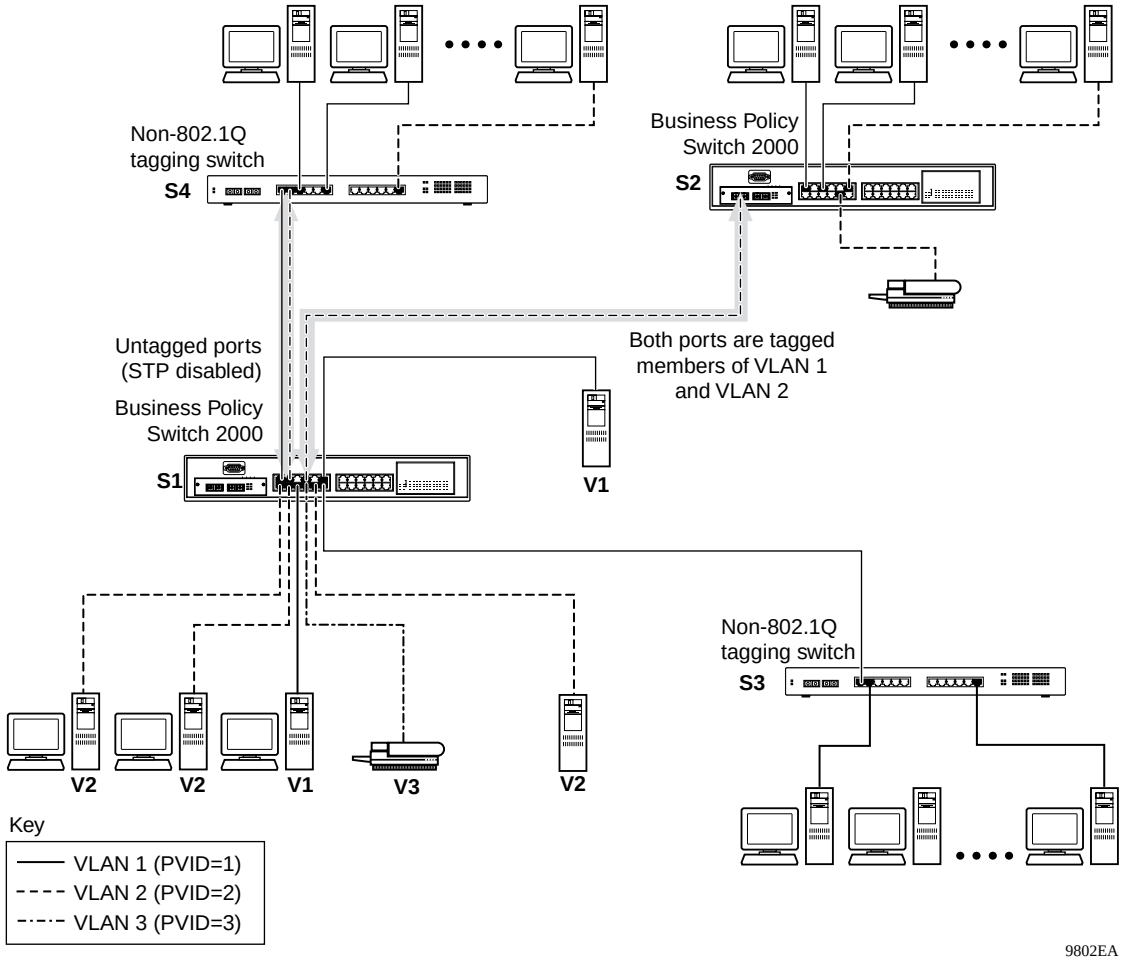
As shown in Figure 33, Switch S1 (Business Policy Switch) is configured with multiple VLANs:

- Ports 1, 6, 11, and 12 are in VLAN 1.
- Ports 2, 3, 4, 7, and 10 are in VLAN 2.
- Port 8 is in VLAN 3.

Because S4 does not support 802.1Q tagging, a single switch port on each switch must be used for each VLAN (see “VLANS spanning multiple untagged switches” on page 77).

The connection to S2 requires only one link between the switches because S1 and S2 are both Business Policy Switches that support 802.1Q tagging (see “VLANs spanning multiple 802.1Q tagged switches” on page 76).

Figure 33 VLAN configuration spanning multiple switches



VLAN configuration rules

VLANs operate according to specific configuration rules. When creating VLANs, consider the following rules that determine how the configured VLAN reacts in any network topology:

- All ports that are involved in port mirroring must have memberships in the same VLANs. If a port is configured for port mirroring, the port's VLAN membership cannot be changed.
- If a port is a trunk group member, all trunk members are added or deleted from the VLAN.
- All ports involved in trunking and port mirroring must have the same VLAN configuration. If a port is on a trunk with a mirroring port, the VLAN configuration cannot be changed.
- VLANs are not dependent on Rate Limiting settings.
- If a port is an IGMP member on any VLAN, and is removed from a VLAN, the port's IGMP membership is also removed.
- If a port is added to a different VLAN, and it is already configured as a static router port, the port is configured as an IGMP member on that specific VLAN.

For more information about configuring VLANs, see "VLAN Configuration Menu screen" on page 154.

See also Appendix E, "Quick steps to features," on page 275 for configuration flowcharts that can help you use this feature.

IGMP snooping

Business Policy Switches can sense Internet Group Management Protocol (IGMP) host membership reports from attached stations and use this information to set up a dedicated path between the requesting station and a local IP Multicast router. After the pathway is established, the Business Policy Switch blocks the IP Multicast stream from exiting any other port that does not connect to another host member, thus conserving bandwidth. The following section describes how Business Policy Switches provide the same benefit as IP Multicast routers, but in the local area.

IGMP is used by IP Multicast routers to learn about the existence of host group members on their directly attached subnets (see RFC 2236). The IP Multicast routers get this information by broadcasting IGMP queries and listening for IP hosts reporting their host group memberships. This process is used to set up a client/server relationship between an IP Multicast source that provides the data streams and the clients that want to receive the data.

Figure 34 shows how IGMP is used to set up the path between the client and server. As shown in this example, the IGMP host provides an IP Multicast stream to designated routers that forward the IP Multicast stream on their local network only if there is a recipient.

The client/server path is set up as follows:

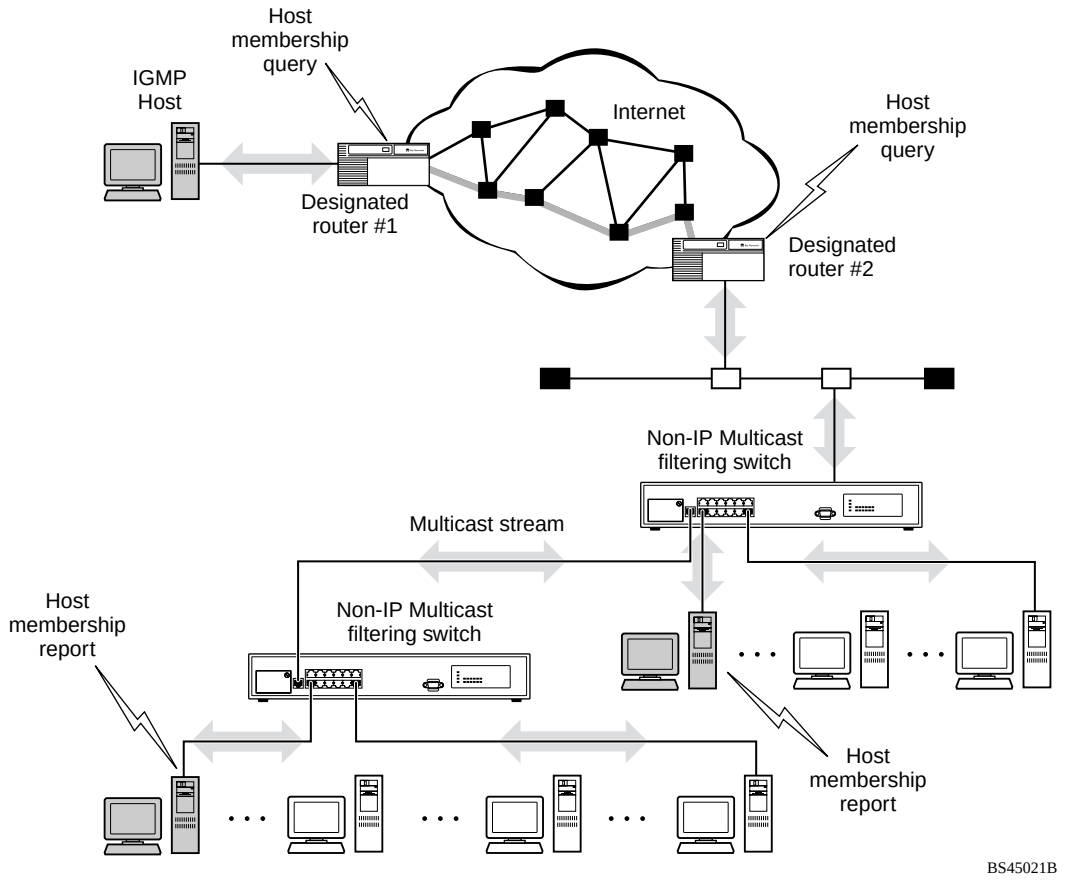
1. The designated router sends out a host membership query to the subnet and receives host membership reports from end stations on the subnet.
2. The designated routers then set up a path between the IP Multicast stream source and the end stations.
3. Periodically, the router continues to query end stations on whether or not to continue participation.
4. As long as any client continues to participate, all clients, including nonparticipating end stations on that subnet, receive the IP Multicast stream.

Note: Although the nonparticipating end stations can filter the IP Multicast traffic, the IP Multicast traffic still exists on the subnet and consumes bandwidth.

IP Multicast can be optimized in a LAN by using IP Multicast filtering switches, such as the Business Policy Switch.

As shown in Figure 34, a non-IP Multicast filtering switch causes IP Multicast traffic to be sent to all segments on the local subnet.

Figure 34 IP Multicast propagation with IGMP routing

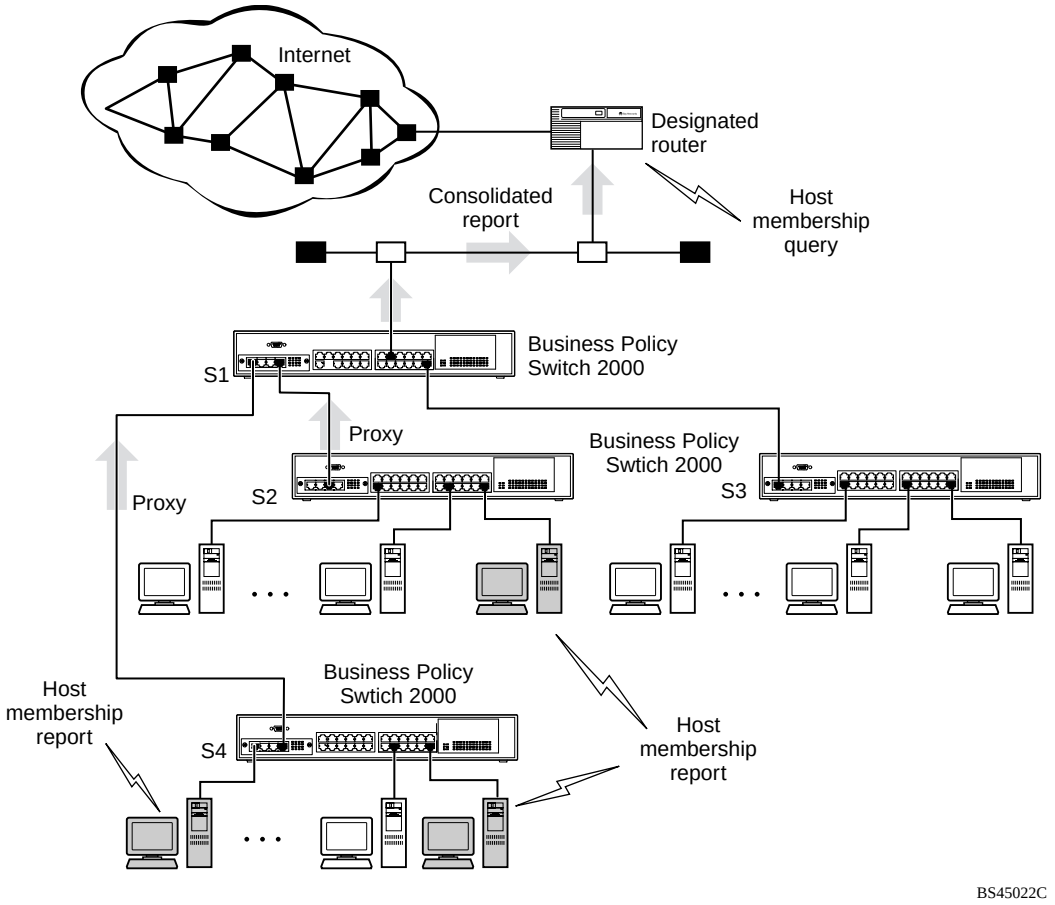


The Business Policy Switch can automatically set up IP Multicast filters so the IP Multicast traffic is only directed to the participating end nodes (see Figure 35).

In Figure 35, switches S1 to S4 represent a LAN connected to an IP Multicast router. The router periodically sends Host Membership Queries to the LAN and listens for a response from end stations. All of the clients connected to switches S1 to S4 are aware of the queries from the router.

One client, connected to S2, responds with a host membership report. Switch S2 intercepts the report from that port, and generates a *proxy* report to its upstream neighbor, S1. Also, two clients connected to S4 respond with host membership reports, causing S4 to intercept the reports and to generate a *consolidated proxy report* to its upstream neighbor, S1.

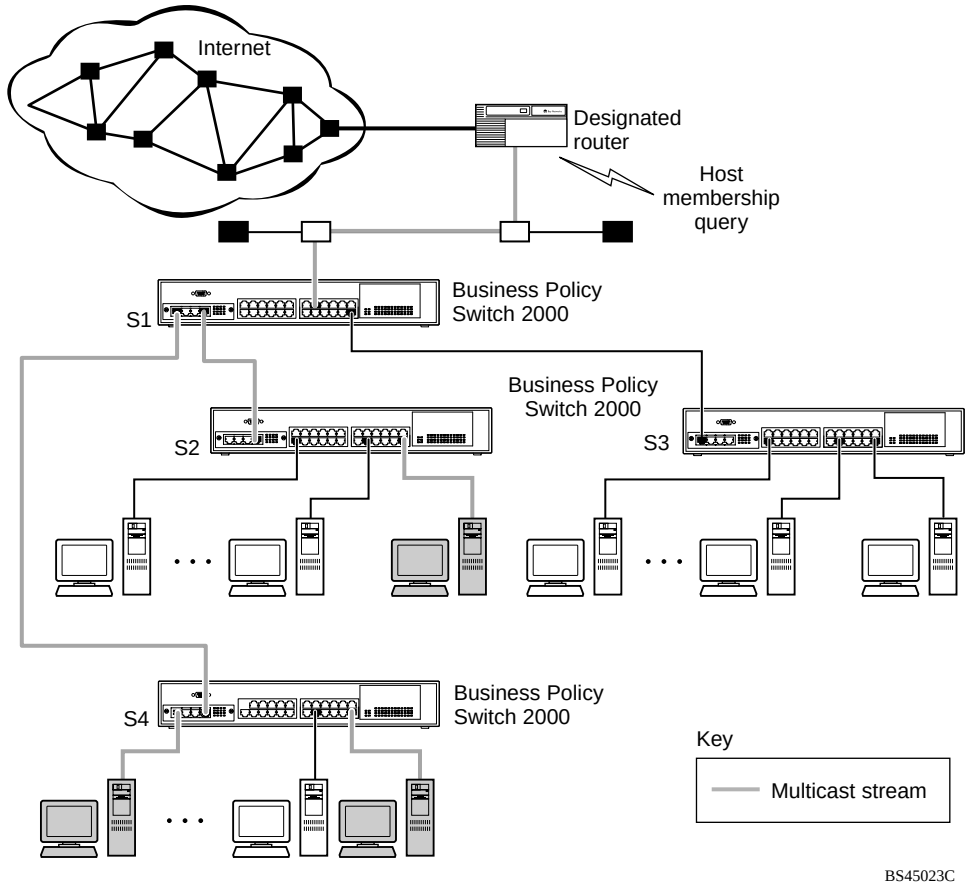
Figure 35 Business Policy Switch filtering IP multicast streams (1 of 2)



Switch S1 treats the consolidated proxy reports from S2 and S4 as if they were reports from any client connected to its ports, and generates a consolidated proxy report to the designated router. In this way, the router receives a single consolidated report from that entire subnet.

After the switches learn which ports are requesting access to the IP Multicast stream, all other ports not responding to the queries are blocked from receiving the IP Multicast (Figure 36).

Figure 36 Business Policy Switch filtering IP multicast streams (2 of 2)



The consolidated proxy report generated by the switch remains transparent to layer 3 of the International Organization for Standardization, Open Systems Interconnection (ISO/OSI) model. (The switch IP address and MAC address are not part of proxy report generation.) The last reporting IGMP group member in each VLAN represents all of the hosts in that VLAN and IGMP group.

IGMP snooping configuration rules

The IGMP snooping feature operates according to specific configuration rules. When configuring your switch for IGMP snooping, consider the following rules that determine how the configuration reacts in any network topology:

- A port that is configured for port mirroring cannot be configured as a static router port.
- If a MultiLink Trunk member is configured as a static router port, all of the MultiLink trunk members are configured as static router ports. Also, if a static router port is removed, and it is a MultiLink Trunk member, all MultiLink trunk members are removed as static router port members, automatically.
- Static router ports must be port members of at least one VLAN.
- If a port is configured as a static router port, it is configured as a static router port for all VLANs on that port. The IGMP configuration is propagated through all VLANs of that port.
- If a static router port is removed, the membership for that port is removed from all VLANs of that port.
- The IGMP snooping feature is not STP dependent.
- The IGMP snooping feature is not Rate Limiting dependent.
- The snooping field must be enabled for the proxy field to have any valid meaning.
- Static router ports are configured per VLAN and per IGMP Version.

Note: Because IGMP snooping is set up per VLAN, all IGMP changes are implemented according to the VLAN configuration for the specified ports.

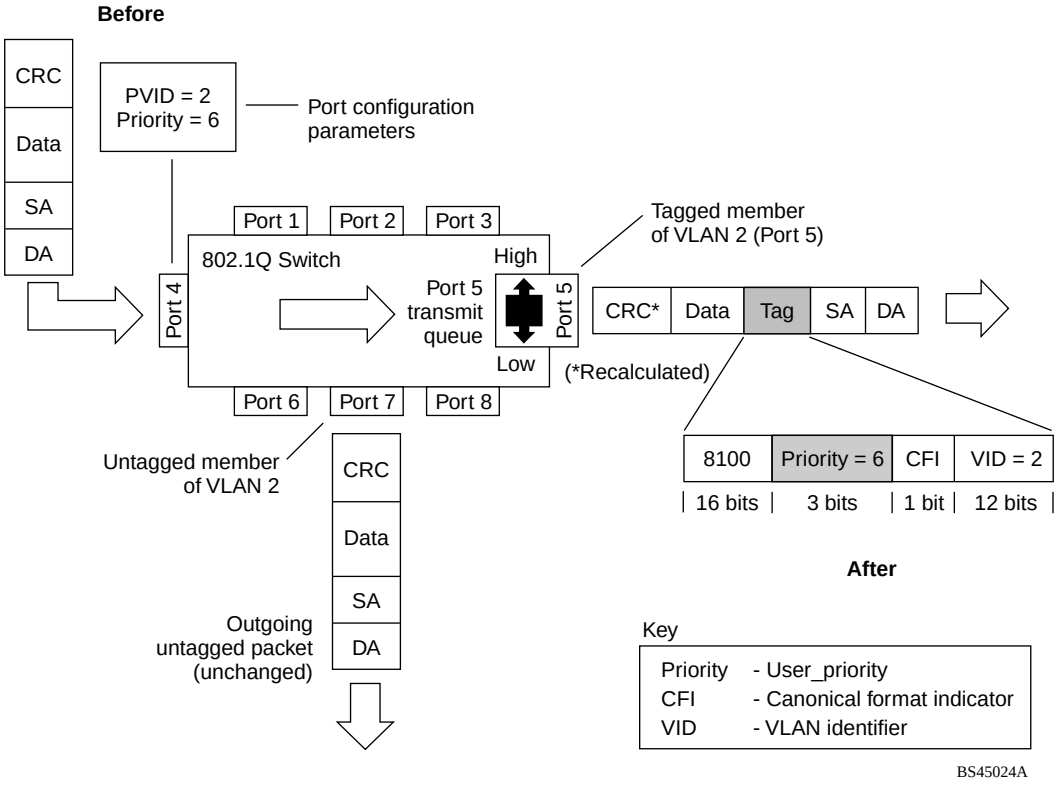
For more information about using the IGMP snooping feature, see Chapter 3, “Using the console interface,” on page 119.

See also Appendix E, “Quick steps to features,” on page 275” for configuration flowcharts that can help you use this feature.

IEEE 802.1p prioritizing

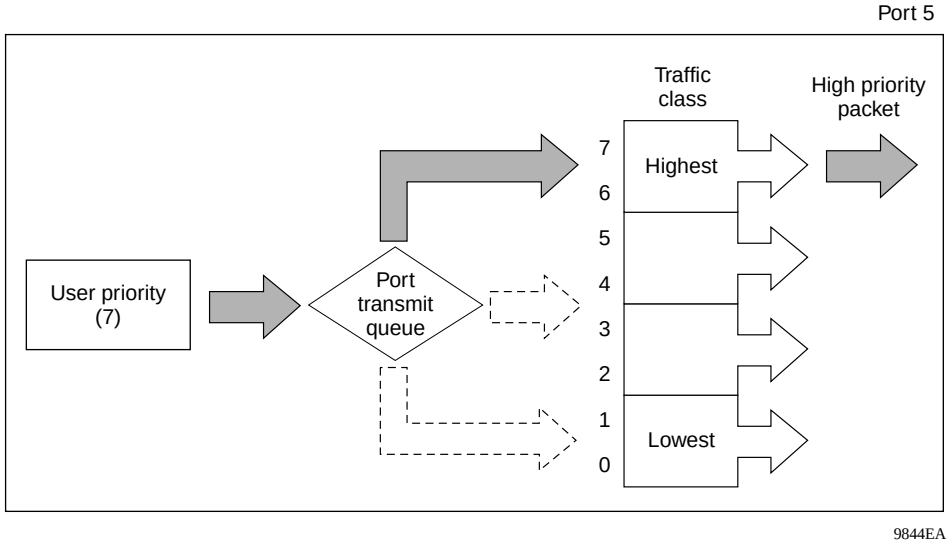
You can use the VLAN Configuration screens to prioritize the order in which the switch forwards packets, on a per-port basis. For example, if messages from a specific segment are crucial to your operation, you can set the switch port connected to that segment to a higher priority level (by default, all switch ports are set to low priority). Untagged packets received by the switch on that port are tagged according to the priority level you assign to the port (see Figure 37).

Figure 37 Prioritizing packets



The newly tagged frame is read within the switch and sent to the port's high or low transmit queue for disposition (Figure 38). The port transmit queue example shown in Figure 38 applies to all ports on the Business Policy Switch.

Figure 38 Port transmit queue



As shown in Figure 38, the switch provides transmission queues ranging from *Highest* to *Lowest*, for any given port. Frames are assigned to one of these queues on the basis of user priority. These priorities are configured in the Web-based management interface. Refer to *Using Web-based Management for the Business Policy Switch 2000* for more information.

Figure 39 shows the VLAN Port Configuration screen setup for port 4 in Figure 37 on page 92.

Figure 39 Setting port priority example

```
                          VLAN Port Configuration


               Unit:                          [ 4   ]
               Port:                          [ 4   ]
               Filter Tagged Frames:          [ No  ]
               Filter Untagged Frames:        [ No  ]
               Filter Unregistered Frames:    [ No  ]
               Port Name:                     [ Unit 1, Port 1 ]
               PVID:                          [ 2   ]
               Port Priority:                 [ 6   ]
               Tagging:                       [ Tagged Trunk  ]



Use space bar to display choices, press <Return> or <Enter> to select
choice.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

For more information about using this feature, see "VLAN Configuration Menu screen" on page 154.

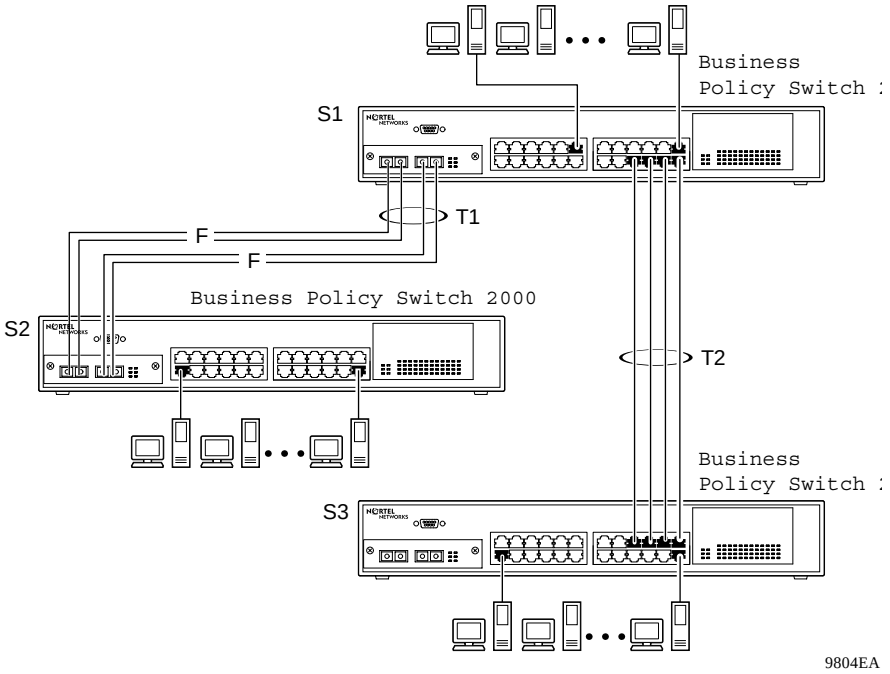
MultiLink Trunks

MultiLink Trunks allow you to group up to four switch ports together to form a link to another switch or server, thus increasing aggregate throughput of the interconnection between the devices (up to 800 Mb/s in full-duplex mode). You can configure up to six MultiLink Trunks. The trunk members can reside on a single unit or on multiple units within the same stack configuration as a *distributed trunk*. MultiLink Trunking software detects misconfigured (or broken) trunk links and redirects traffic on the misconfigured or broken trunk link to other trunk members within that trunk.

You can use the Trunk Configuration screen to create switch-to-switch and switch-to-server MultiLink Trunk links (Figure 40 and Figure 41).

Figure 40 shows two trunks (T1 and T2) connecting Switch S1 to switches S2 and S3.

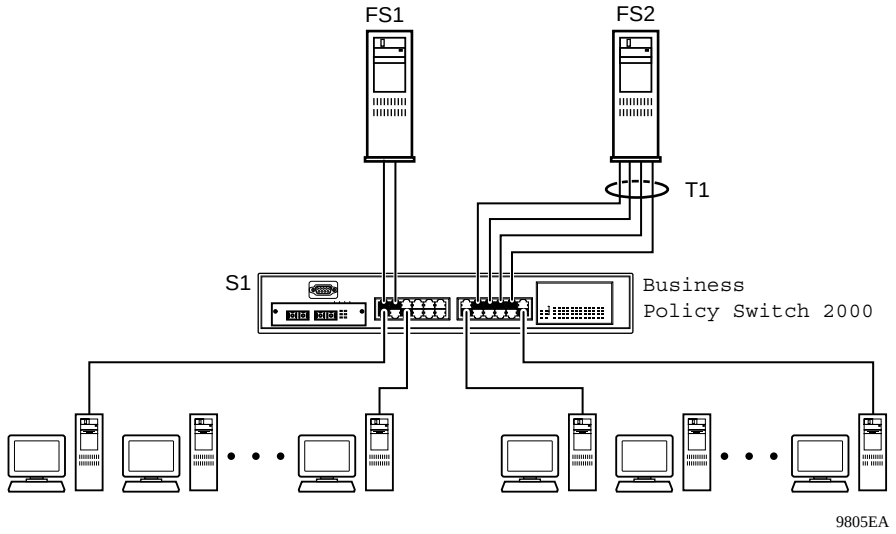
Figure 40 Switch-to-switch trunk configuration example



You can configure each of the trunks shown in Figure 40 with up to four switch ports to provide up to 800 Mb/s aggregate bandwidth through each trunk, in full-duplex mode. As shown in this example, when traffic between switch-to-switch connections approaches single port bandwidth limitations, creating a MultiLink Trunk can supply the additional bandwidth required to improve the performance.

Figure 41 shows a typical switch-to-server trunk configuration. In this example, file server FS1 uses dual MAC addresses, using one MAC address for each network interface card (NIC). For this reason, FS1 does not require a trunk assignment. FS2 is a single MAC server (with a four-port NIC) and is set up as trunk configuration T1.

Figure 41 Switch-to-server trunk configuration example



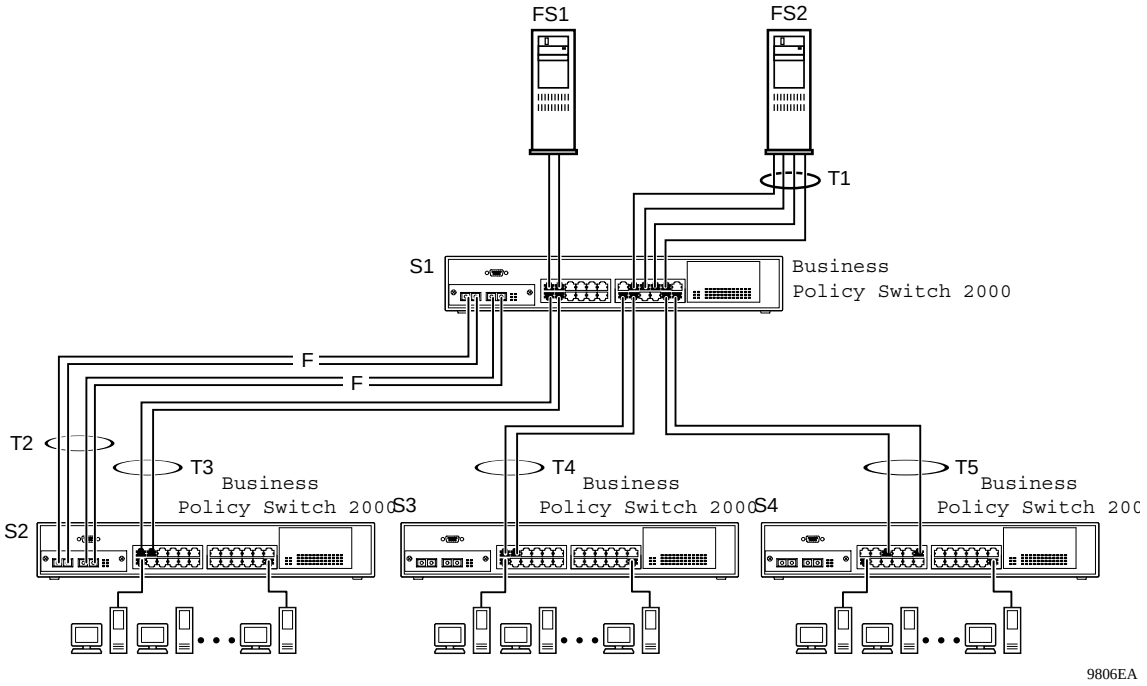
Client/server configuration using MultiLink Trunks

Figure 42 shows an example of how MultiLink Trunking can be used in a client/server configuration. In this example, both servers connect directly to Switch S1. FS2 is connected through a trunk configuration (T1). The switch-to-switch connections are through trunks (T2, T3, T4, and T5).

Clients accessing data from the servers (FS1 and FS2) are provided with maximized bandwidth through trunks T1, T2, T3, T4, and T5. Trunk members (the ports making up each trunk) do not have to be consecutive switch ports; you can select ports randomly, as shown by T5.

With spanning tree *enabled*, one of the trunks (T2 or T3) acts as a redundant (backup) trunk to Switch S2. With spanning tree *disabled*, you must configure trunks T2 and T3 into separate VLANs for this configuration to function properly Refer to "IEEE 802.1Q VLAN workgroups" on page 69 for more information.

Figure 42 Client/server configuration example



The trunk configuration screens for switches S1 to S4 are shown in "Trunk configuration screen examples" following this section. For detailed information about configuring trunks, see "MultiLink Trunk Configuration screen" on page 175.

Trunk configuration screen examples

This section shows examples of the MultiLink Trunk configuration screens for the client/server configuration example shown in Figure 42. The screens show how you could set up the trunk configuration screens for switches S1 to S4. See "Spanning tree considerations for MultiLink Trunks" on page 108, and "MultiLink Trunk Configuration screen" on page 175 for more information.

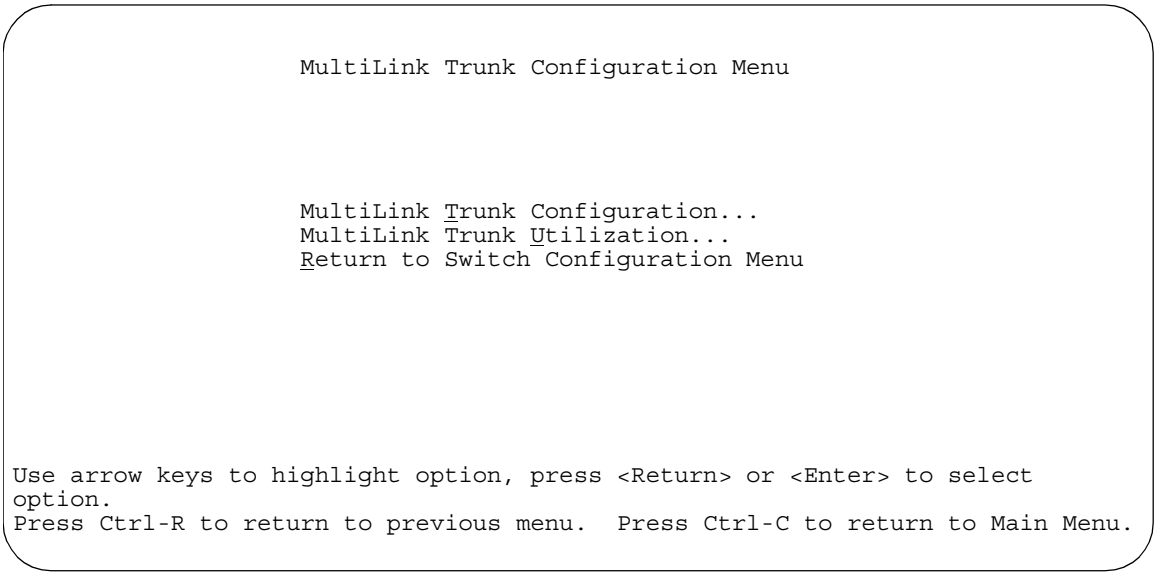
Trunk configuration screen for Switch S1

Switch S1 is set up with five trunk configurations: T1, T2, T3, T4, and T5.

To set up the S1 trunk configuration:

➨ Choose MultiLink Trunk Configuration (or press t) from the MultiLink Trunk Configuration Menu screen (Figure 43).

Figure 43 Choosing the MultiLink Trunk Configuration Menu screen


MultiLink Trunk Configuration Menu
MultiLink Trunk Configuration...
MultiLink Trunk Utilization...
Return to Switch Configuration Menu
Use arrow keys to highlight option, press <Return> or <Enter> to select option.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

The MultiLink Trunk Configuration Menu screen opens (Figure 44).

Figure 44 MultiLink Trunk Configuration screen for Switch S1

```
                          MultiLink Trunk Configuration

Trunk   Trunk Members (Unit/Port)      STP Learning   Trunk Mode    Trunk Status
----- ------------------------------ ------------ --------------- ------------
  1   [  /15 ][  /17 ][  /19 ][  /21 ] [ Normal   ]      Basic      [ Enabled  ]
  2   [  /25 ][  /26 ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  3   [  /2  ][  /4  ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  4   [  /14 ][  /16 ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  5   [  /22 ][  /24 ][  /   ][  /   ] [ Fast     ]      Basic      [ Enabled  ]
  6   [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]

Trunk     Trunk Name
----- ------------------
  1   [ S1:T1 to FS2 ]
  2   [ S1:T2 to S2  ]
  3   [ S1:T3 to S2  ]
  4   [ S1:T4 to S3  ]
  5   [ S1:T5 to S4  ]
  6   [ Trunk #6 ]


Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Switch S1 is configured as follows:

- **Trunk** (read only) indicates the trunks (1 to 6) that correspond to the switch ports specified in the Trunk Members fields.
- **Trunk Members (Unit/Port)** indicates the ports that can be configured, in each row, to create the corresponding trunk:

Note: The Unit value (in the Unit/Port field) is not configurable when the switch is operating standalone. For detailed information about the MultiLink Trunk Configuration screen fields, see "MultiLink Trunk Configuration screen" on page 175.

  - Ports 15, 17, 19, and 21 are assigned as trunk members of trunk 1.
  - Ports 25 and 26 are assigned as trunk members of trunk 2.
  - Ports 2 and 4 are assigned as trunk members of trunk 3.
  - Ports 14 and 16 are assigned as trunk members of trunk 4.
  - Ports 22 and 24 are assigned as trunk members of trunk 5.
- **STP Learning** indicates the spanning tree participation setting for each of the trunks:
  - Trunks 1 through 4 are enabled for Normal STP Learning.
  - Trunk 5 is enabled for Fast STP Learning.
- **Trunk Mode** (read only) indicates the Trunk Mode for each of the trunks.

  The Trunk Mode field values for trunks 1 to 5 are set to Basic. Source MAC addresses are statically assigned to specific trunk members for flooding and forwarding, which allows the switch to stabilize and distribute the data streams of source addresses across the trunk members.
- **Trunk Status** indicates the Trunk Status for each of the trunks. When set to Enabled, the configuration settings for that specific trunk are activated.
- **Trunk Name** indicates optional fields for assigning names to the corresponding configured trunks.

  The names chosen for this example provide meaningful information to the user of this switch (for example, S1:T1 to FS2 indicates that Trunk 1, in Switch S1, connects to File Server 2).

Trunk configuration screen for Switch S2

As shown in Figure 42 on page 97, Switch S2 is set up with two trunk configurations (T2 and T3). Both trunks connect directly to Switch S1.

As in the previous screen examples, to set up a trunk configuration, choose MultiLink Trunk Configuration from the MultiLink Trunk Configuration Menu screen.

Figure 45 shows the MultiLink Trunk Configuration screen for Switch S2.

Figure 45 MultiLink Trunk Configuration screen for Switch S2

```
                          MultiLink Trunk Configuration

Trunk   Trunk Members (Unit/Port)       STP Learning   Trunk Mode    Trunk Status
-----  ------------------------------- ------------ ---------------- ------------
  1    [  /25 ][  /26 ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  2    [  /1  ][  /3  ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  3    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  4    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  5    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  6    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]

Trunk     Trunk Name
-----  ------------------
  1    [ S2:T2 to S1 ]
  2    [ S2:T3 to S1 ]
  3    [ Trunk #3 ]
  4    [ Trunk #4 ]
  5    [ Trunk #5 ]
  6    [ Trunk #6 ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Switch S2 is configured as follows:

- **Trunk** (read only) indicates the trunks (1 to 6) that correspond to the switch ports specified in the Trunk Members fields.
- **Trunk Members (Unit/Port)** indicates the ports that can be configured, in each row, to create the corresponding trunk:
  - — Ports 25 and 26 are assigned as trunk members of trunk 1.
  - — Ports 1 and 3 are assigned as trunk members of trunk 2.
- **STP Learning** indicates the spanning tree participation setting for each of the trunks. Trunks 1 and 2 are enabled for Normal STP Learning.
- **Trunk Mode** (read only) indicates the Trunk Mode for each of the trunks. The Trunk Mode field values for trunks 1 and 2 are set to Basic. Source MAC addresses are statically assigned to specific trunk members for flooding and forwarding, which allows the switch to stabilize and distribute the data streams of source addresses across the trunk members.

- **Trunk Status** indicates the Trunk Status for each of the trunks. When set to Enabled, the configuration settings for that specific trunk are activated.
- **Trunk Name** indicates optional fields for assigning names to the corresponding configured trunks.

  The names chosen for this example provide meaningful information to the user of this switch (for example, S2:T2 to S1 indicates that Trunk 1, in Switch S2, connects to Switch 1).

Trunk Configuration screen for Switch S3

As shown in Figure 42 on page 97, Switch S3 is set up with one trunk configuration (T4). This trunk connects directly to Switch S1.

As in the previous screen examples, to set up an interswitch trunk configuration, choose MultiLink Trunk Configuration from the MultiLink Trunk Configuration Menu screen.

Figure 46 shows the MultiLink Trunk Configuration screen for Switch S3.

Figure 46 MultiLink Trunk Configuration screen for Switch S3

```
                          MultiLink Trunk Configuration

Trunk   Trunk Members (Unit/Port)      STP Learning   Trunk Mode    Trunk Status
-----  ------------------------------ ------------ --------------- ------------
  1    [  /1  ][  /3  ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  2    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  3    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  4    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  5    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  6    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]

Trunk     Trunk Name
-----  ------------------
  1    [ S3:T4 to S1 ]
  2    [ Trunk #2 ]
  3    [ Trunk #3 ]
  4    [ Trunk #4 ]
  5    [ Trunk #5 ]
  6    [ Trunk #6 ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Switch S3 is configured as follows:

- **Trunk** (read only) indicates the trunk (1 to 6) that corresponds to the switch ports specified in the Trunk Members fields.
- **Trunk Members (Unit/Port)** indicates the ports that can be configured, in each row, to create the corresponding trunk. Ports 1 and 3 are assigned as trunk members of trunk 1.
- **STP Learning** indicates the spanning tree participation setting for each of the trunks. Trunk 1 is enabled for Normal STP Learning.
- **Trunk Mode** (read only) indicates the Trunk Mode for each of the trunks. The Trunk Mode field value for trunk 1 is set to Basic. Source MAC addresses are statically assigned to specific trunk members for flooding and forwarding, which allows the switch to stabilize and distribute the data streams of source addresses across the trunk members.
- **Trunk Status** indicates the Trunk Status for each of the trunks. When set to Enabled, the configuration settings for that specific trunk are activated.
- **Trunk Name** indicates optional fields for assigning names to the corresponding configured trunks.

Trunk Configuration screen for Switch S4

The names chosen for this example provide meaningful information to the user of this switch (for example, S3:T4 to S1 indicates that Trunk 1, in Switch S3, connects to Switch 1).

As shown in Figure 47, Switch S4 is set up with one trunk configuration (T5). This trunk connects directly to Switch S1.

As in the previous screen examples, to set up a trunk configuration, choose MultiLink Trunk Configuration from the MultiLink Trunk Configuration Menu screen.

Figure 47 shows the MultiLink Trunk Configuration screen for Switch S4.

Figure 47 MultiLink Trunk Configuration screen for Switch S4

```
                          MultiLink Trunk Configuration

Trunk   Trunk Members (Unit/Port)       STP Learning   Trunk Mode    Trunk Status
-----  ------------------------------  ------------  ---------------  ------------
  1    [  /5  ][  /11 ][  /   ][  /   ] [ Normal   ]      Basic      [ Enabled  ]
  2    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  3    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  4    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  5    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]
  6    [  /   ][  /   ][  /   ][  /   ] [ Normal   ]      Basic      [ Disabled ]

Trunk     Trunk Name
-----  ------------------
  1    [ S4:T5 to S1 ]
  2    [ Trunk #2 ]
  3    [ Trunk #3 ]
  4    [ Trunk #4 ]
  5    [ Trunk #5 ]
  6    [ Trunk #6 ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Switch S4 is configured as follows:

- **Trunk** (read only) indicates the trunk (1 to 6) that corresponds to the switch ports specified in the Trunk Members fields.
- **Trunk Members (Unit/Port)** indicates the ports that can be configured, in each row, to create the corresponding trunk. Ports 5 and 11 are assigned as trunk members of trunk T1.
- **STP Learning** indicates the spanning tree participation setting for each of the trunks. Trunk 1 is enabled for Normal STP Learning.
- **Trunk Mode** (read only) indicates the Trunk Mode for each of the trunks. The Trunk Mode field value for trunk 1 is set to Basic. Source MAC addresses are statically assigned to specific trunk members for flooding and forwarding, which allows the switch to stabilize and distribute the data streams of source addresses across the trunk members.

- **Trunk Status** indicates the Trunk Status for each of the trunks. When it is set to Enabled, the configuration settings for that specific trunk are activated.
- **Trunk Name** indicates optional fields for assigning names to the corresponding configured trunks.

  The names chosen for this example provide meaningful information to the user (for example, S4:T5 to S1 indicates that Trunk 1, in Switch S4, connects to Switch 1).

Before you configure trunks

When you create and enable a trunk, the trunk members (switch ports) take on certain settings necessary for correct operation of the MultiLink Trunking feature.

Before you configure your MultiLink Trunk, you must consider these settings, along with specific configuration rules, as follows:

1. Read the configuration rules provided in the next section, "MultiLink Trunking configuration rules" on page 106.
2. Determine which switch ports (up to four) are to become *trunk members* (the specific ports making up the trunk). A minimum of two ports are required for each trunk.

   Ensure that the chosen switch ports are set to Enabled, using either the Port Configuration screen (see "Port Configuration screen" on page 167) or network management.

   Trunk member ports must have the same VLAN configuration.
3. All network cabling should be complete and stable before configuring any trunks, to avoid configuration errors.
4. Consider how the existing spanning tree will react to the new trunk configuration (see "Spanning tree considerations for MultiLink Trunks" on page 108).
5. Consider how existing VLANs will be affected by the addition of a trunk.
6. After completing the above steps, see "MultiLink Trunk Configuration screen" on page 175 for screen examples and field descriptions that will help you configure your MultiLink Trunks.

MultiLink Trunking configuration rules

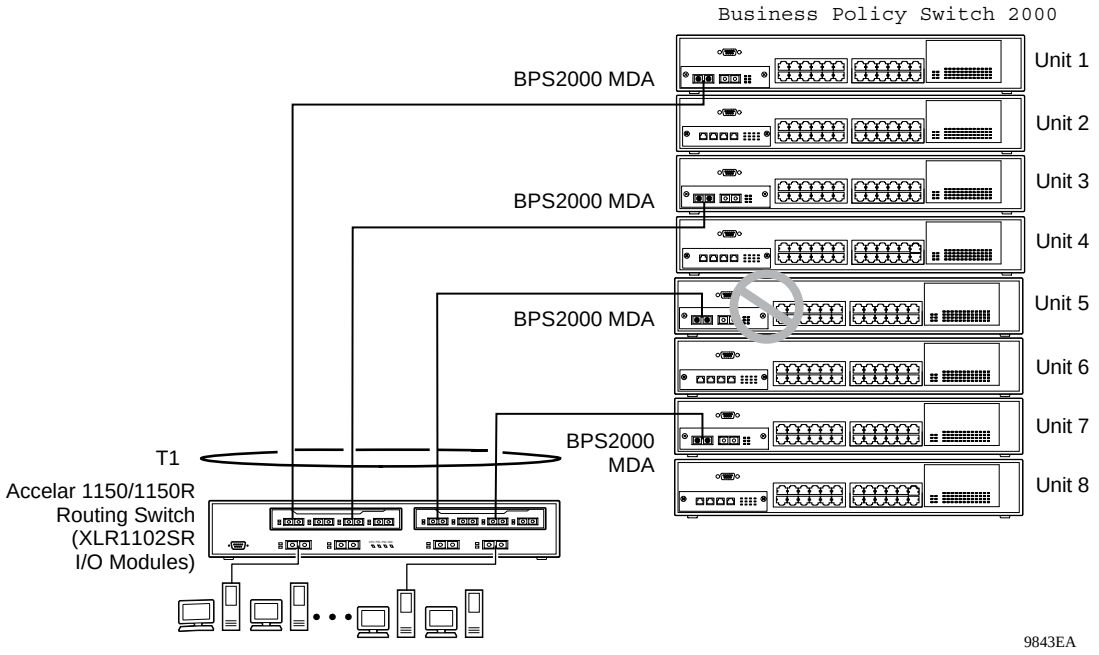
The MultiLink Trunking feature is deterministic; that is, it operates according to specific configuration rules. When creating trunks, consider the following rules that determine how the MultiLink Trunk reacts in any network topology:

- Any port that participates in MultiLink Trunking must be an active port (set to Enabled via the Port Configuration screen or through network management).
- All trunk members must have the same VLAN configuration before the Trunk Configuration screen's Trunk Status field can be set to Enabled (see "VLAN Configuration Menu screen" on page 154).
- When an active port is configured in a trunk, the port becomes a *trunk member* when you set the Trunk Status field to Enabled. The spanning tree parameters for the port then change to reflect the new trunk settings.
- If you change the spanning tree participation of any trunk member to Enabled or Disabled, the spanning tree participation of all members of that trunk changes similarly (see "Spanning tree considerations for MultiLink Trunks" on page 108).
- When a trunk is enabled, the trunk spanning tree participation setting takes precedence over that of any trunk member. When a trunk is active, you can change the trunk STP setting from either the Trunk Configuration screen or the Spanning Tree Configuration screen.
- If you change the VLAN settings of any trunk member, the VLAN settings of all members of that trunk change similarly.
- When you set any trunk member to Disabled (not active) through the Port Configuration screen or through network management, the trunk member is removed from the trunk. The trunk member has to be reconfigured through the Trunk Configuration screen to rejoin the trunk. A screen prompt precedes this action. A trunk member cannot be disabled if there are only two trunk members on the trunk.
- You cannot configure a trunk member as a monitor port (see "Port Mirroring Configuration screen" on page 180).
- Trunks cannot be monitored by a monitor port; however, trunk members can be monitored (see "Port-based mirroring configuration" on page 112).
- All trunk members must have identical IGMP configurations.
- If you change the IGMP snooping configuration for any trunk member, the IGMP snooping settings for all trunk members change.

How the MultiLink Trunk reacts to losing distributed trunk members

If your MultiLink Trunk (Figure 48) spans separate units in a stack configuration and any of those units (or trunked MDAs) becomes inactive from a loss of power or unit failure, the unaffected trunk members remain operational.

Figure 48 Loss of distributed trunk members



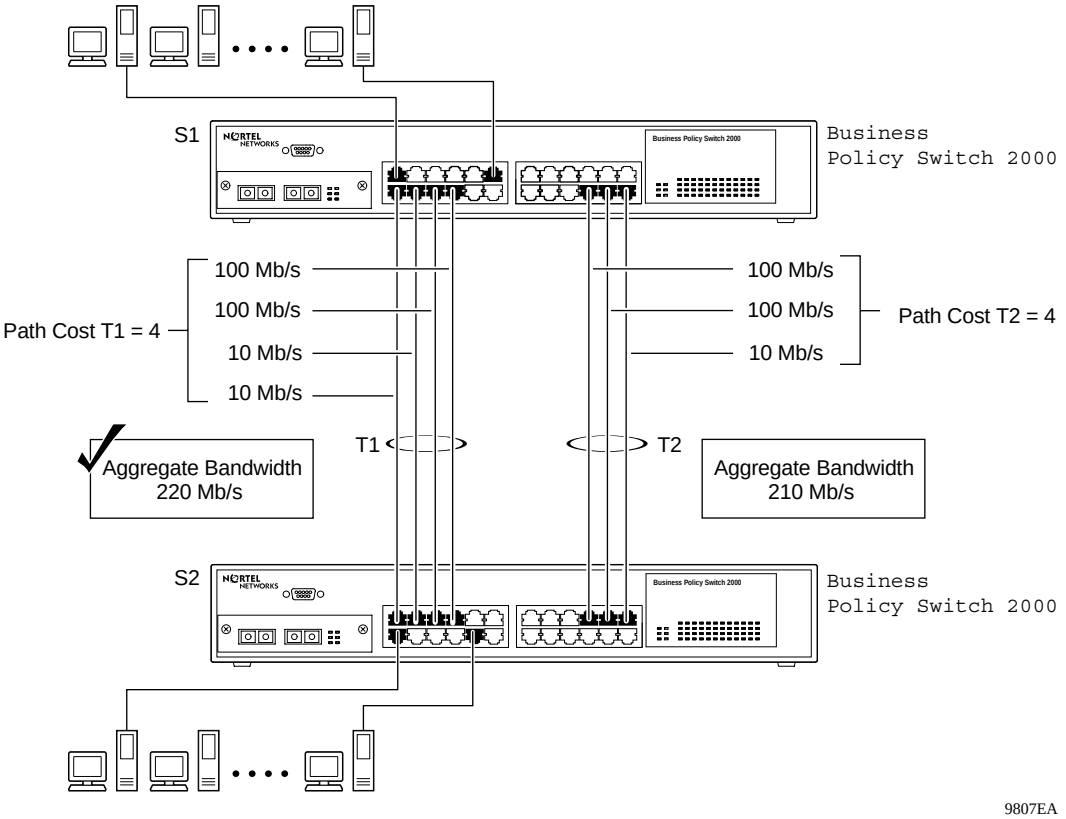
However, until you correct the cause of the failure or change the trunk Status field to Disabled, you will be unable to modify any of the following parameters for the affected trunk:

- VLAN configuration
- Spanning Tree configuration
- Port Mirroring configuration
- Port configuration
- IGMP configuration
- Rate Limiting configuration

Spanning tree considerations for MultiLink Trunks

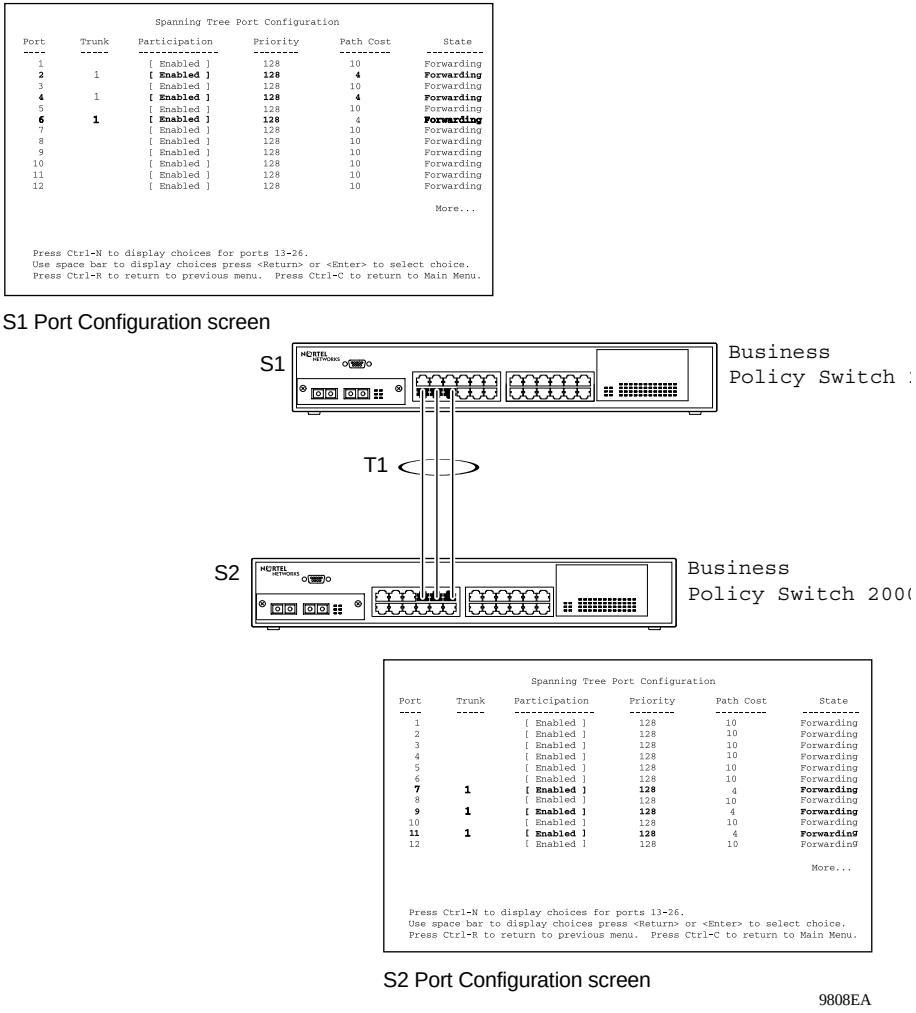
The spanning tree Path Cost parameter is recalculated based on the aggregate bandwidth of the trunk. For example, Figure 49 shows a four-port trunk (T1) with two port members operating at 100 Mb/s and two at 10 Mb/s. Trunk T1 provides an aggregate bandwidth of 220 Mb/s. The Path Cost for T1 is 4 (Path Cost = 1000/ LAN speed, in Mb/s). Another three-port trunk (T2) is configured with an aggregate bandwidth of 210 Mb/s, with a comparable Path Cost of 4. When the Path Cost calculations for both trunks are equal, the software chooses the trunk with the larger aggregate bandwidth (T1) to determine the most efficient path.

Figure 49 Path Cost arbitration example



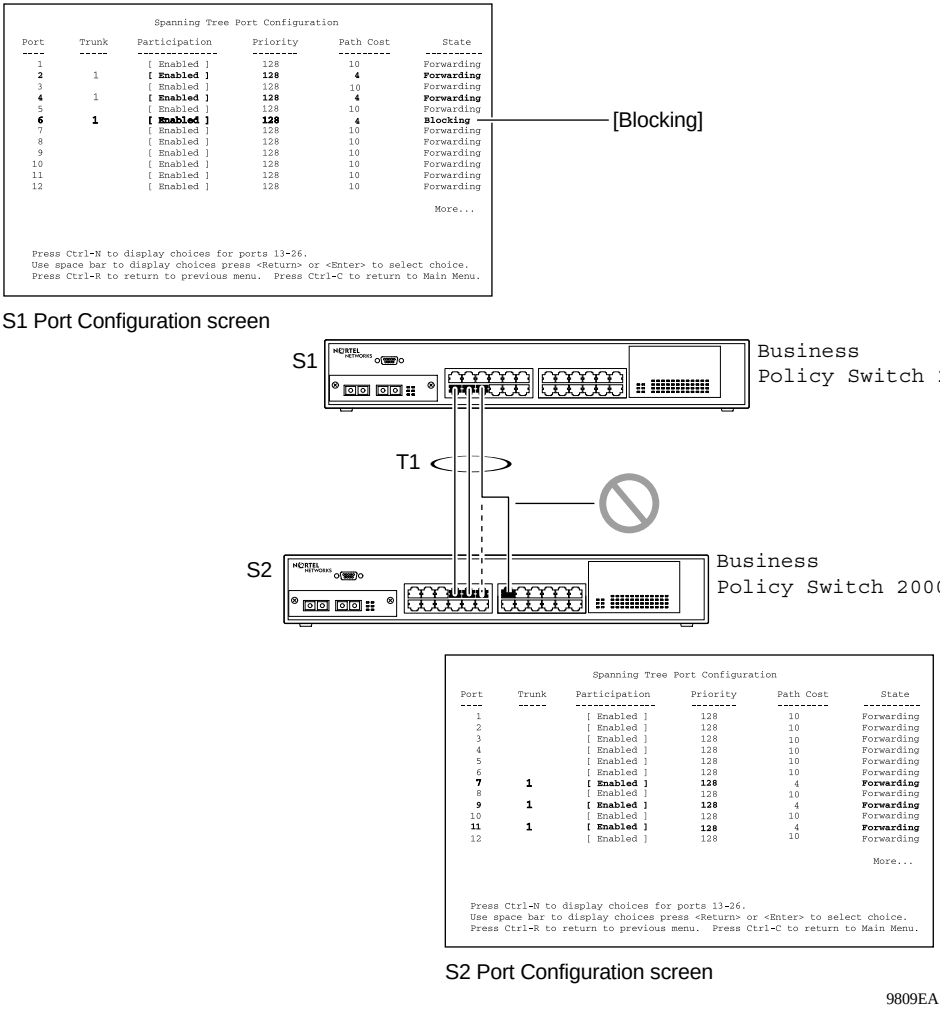
The switch can also detect trunk member ports that are physically misconfigured. For example, in Figure 50, trunk member ports 2, 4, and 6 of Switch S1 are configured *correctly* to trunk member ports 7, 9, and 11 of Switch S2. The Spanning Tree Port Configuration screen for each switch shows the port state field for each port in the Forwarding state.

Figure 50 Example 1: correctly configured trunk


Spanning Tree Port Configuration
Port Trunk Participation Priority Path Cost State
1 [Enabled] 128 10 Forwarding
2 1 [Enabled] 128 4 Forwarding
3 [Enabled] 128 10 Forwarding
4 1 [Enabled] 128 4 Forwarding
5 [Enabled] 128 10 Forwarding
6 1 [Enabled] 128 4 Forwarding
7 [Enabled] 128 10 Forwarding
8 [Enabled] 128 10 Forwarding
9 [Enabled] 128 10 Forwarding
10 [Enabled] 128 10 Forwarding
11 [Enabled] 128 10 Forwarding
12 [Enabled] 128 10 Forwarding
More...
Press Ctrl-N to display choices for ports 13-26.
Use space bar to display choices press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.
S1 Port Configuration screen
S1
Business
Policy Switch
T1
S2
Business
Policy Switch 200
Spanning Tree Port Configuration
Port Trunk Participation Priority Path Cost State
1 [Enabled] 128 10 Forwarding
2 [Enabled] 128 10 Forwarding
3 [Enabled] 128 10 Forwarding
4 [Enabled] 128 10 Forwarding
5 [Enabled] 128 10 Forwarding
6 [Enabled] 128 10 Forwarding
7 1 [Enabled] 128 4 Forwarding
8 [Enabled] 128 10 Forwarding
9 1 [Enabled] 128 4 Forwarding
10 [Enabled] 128 10 Forwarding
11 1 [Enabled] 128 4 Forwarding
12 [Enabled] 128 10 Forwarding
More...
Press Ctrl-N to display choices for ports 13-26.
Use space bar to display choices press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.
S2 Port Configuration screen
9808EA

If Switch S2's trunk member port 11 is physically disconnected and then reconnected to port 13, the Spanning Tree Port Configuration screen for Switch S1 changes to show port 6 in the Blocking state (Figure 51).

Figure 51 Example 2: detecting a misconfigured port


Spanning Tree Port Configuration
Port Trunk Participation Priority Path Cost State
1 [Enabled] 128 10 Forwarding
2 1 [Enabled] 128 4 Forwarding
3 [Enabled] 128 10 Forwarding
4 1 [Enabled] 128 4 Forwarding
5 [Enabled] 128 10 Forwarding
6 1 [Enabled] 128 4 Blocking
7 [Enabled] 128 10 Forwarding
8 [Enabled] 128 10 Forwarding
9 [Enabled] 128 10 Forwarding
10 [Enabled] 128 10 Forwarding
11 [Enabled] 128 10 Forwarding
12 [Enabled] 128 10 Forwarding
More...
Press Ctrl-N to display choices for ports 13-26.
Use space bar to display choices press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.
[Blocking]
S1 Port Configuration screen
S1
Business
Policy Switch
T1
S2
Business
Policy Switch 200
Spanning Tree Port Configuration
Port Trunk Participation Priority Path Cost State
1 [Enabled] 128 10 Forwarding
2 [Enabled] 128 10 Forwarding
3 [Enabled] 128 10 Forwarding
4 [Enabled] 128 10 Forwarding
5 [Enabled] 128 10 Forwarding
6 [Enabled] 128 10 Forwarding
7 1 [Enabled] 128 4 Forwarding
8 [Enabled] 128 10 Forwarding
9 1 [Enabled] 128 4 Forwarding
10 [Enabled] 128 10 Forwarding
11 1 [Enabled] 128 4 Forwarding
12 [Enabled] 128 10 Forwarding
More...
Press Ctrl-N to display choices for ports 13-26.
Use space bar to display choices press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.
S2 Port Configuration screen
9809EA

Additional tips about the MultiLink Trunking feature

When you create a MultiLink Trunk, the individual trunk members (the specific ports that make up the trunk) logically connect and react as a single entity. For example, if you change spanning tree parameters for *any* trunk member, the spanning tree parameters for *all* trunk members change.

All configured trunks are indicated in the Spanning Tree Configuration screen. The Trunk field lists the active trunks, adjacent to the port numbers that correspond to the specific trunk member for that trunk.

When a trunk is active, you can disable spanning tree participation using the Trunk Configuration screen or using the Spanning Tree Configuration screen.

When a trunk is not active, the spanning tree participation setting in the Trunk Configuration screen does not take effect until you set the Trunk Status field to Enabled.

The trunk is also viewed by management stations as a single spanning tree port. The spanning tree port is represented by the trunk member with the lowest port number. For example, if ports 13, 14, 15, and 16 are trunk members of trunk T1, the management station views trunk T1 as spanning tree port 13.

For more information about using the MultiLink Trunking feature, see “MultiLink Trunk Configuration Menu screen” on page 173.

See also Appendix E, “Quick steps to features,” on page 275 for configuration flowcharts that can help you use this feature.

Port mirroring

You can designate one of your switch ports to monitor traffic on any two specified switch ports (port-based) or to monitor traffic to or from any two specified addresses that the switch has learned (address-based).

Note: A probe device, such as the Nortel Networks StackProbe™ or equivalent, must be connected to the designated monitor port to use this feature (contact your Nortel Networks sales agent for details about the StackProbe).

The following sections provide sample configurations for both monitoring modes available with the Port Mirroring feature:

- Port-based mirroring
- Address-based mirroring

A sample Port Mirroring Configuration screen accompanies each network configuration example. Note that the displayed screens do not show all of the screen prompts that precede some actions.

For example, when you configure a switch for port mirroring or when you modify an existing port mirroring configuration, the new configuration does not take effect until you respond [Yes] to the following screen prompt:

```
Is your port mirroring configuration complete?     [ Yes ]
```

Port-based mirroring configuration

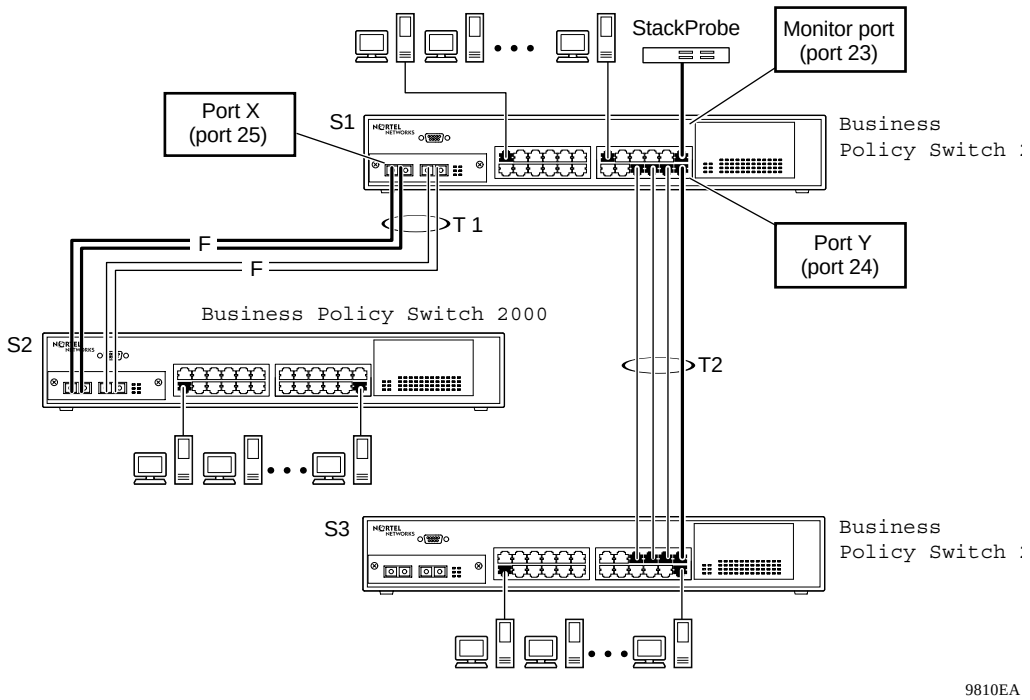
Figure 52 shows an example of a port-based mirroring configuration where port 23 is designated as the monitor port for ports 24 and 25 of Switch S1. Although this example shows ports 24 and 25 monitored by the monitor port (port 23), any of the trunk members of T1 and T2 can also be monitored.

In this example, Figure 52 shows port X and port Y as members of Trunk T1 and Trunk T2. Port X and port Y are not required to always be members of Trunk T1 and Trunk T2.

Note: Trunks cannot be monitored and trunk members cannot be configured as monitor ports (see "MultiLink Trunking configuration rules" on page 106).

Figure 52 shows the Port Mirroring Configuration screen setup for this example.

Figure 52 Port-based mirroring configuration example



In the configuration example shown in Figure 52, the designated monitor port (port 23) can be set to monitor traffic in any of the following modes:

- Monitor all traffic received by port X.
- Monitor all traffic transmitted by port X.
- Monitor all traffic received and transmitted by port X.

- Monitor all traffic received by port X or transmitted by port Y.
- Monitor all traffic received by port X (destined to port Y) and then transmitted by port Y.
- Monitor all traffic received/transmitted by port X and transmitted/received by port Y (conversations between port X and port Y).

As shown in the Port Mirroring Configuration screen example (Figure 53), port 23 is designated as the Monitor Port for ports 24 and 25 in Switch S1.

Note: The Unit value (in the Unit/Port field) is not configurable when the switch is operating standalone. For detailed information about the MultiLink Trunk Configuration screen fields, see "MultiLink Trunk Configuration Menu screen" on page 173.

The Monitoring Mode field [- > Port X or Port Y - >] indicates that all traffic received by port X *or* all traffic transmitted by port Y is currently being monitored by the StackProbe attached to Monitor Port 23.

The screen data displayed at the bottom of the screen shows the currently active port mirroring configuration.

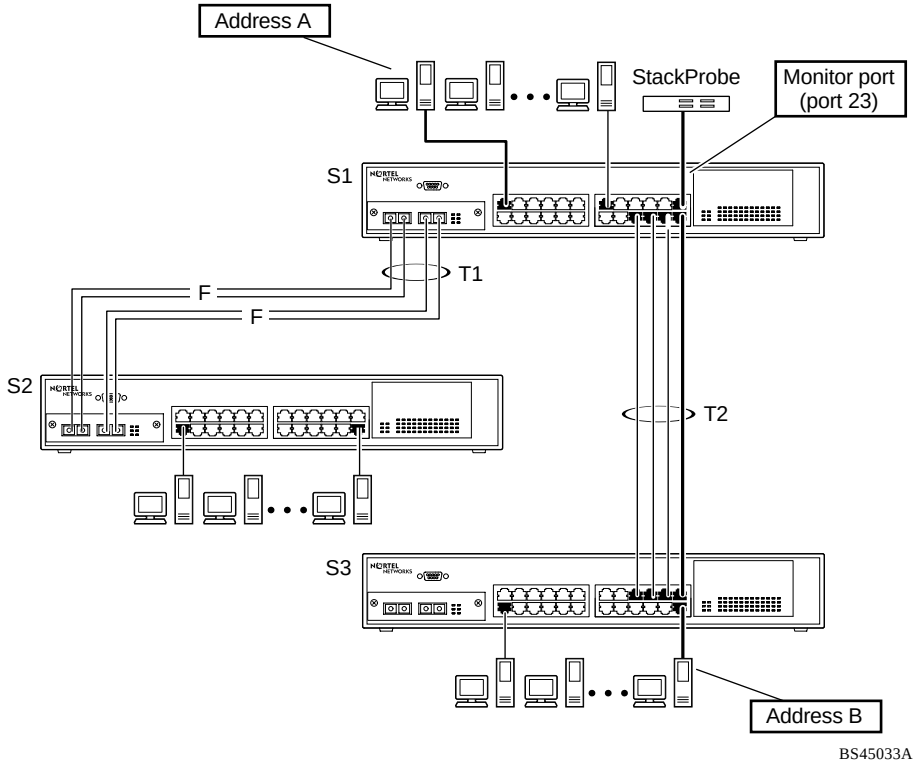
Figure 53 Port Mirroring Configuration port-based screen example

```
                        Port Mirroring Configuration


                     Monitoring Mode:  [  -> Port X   or    Port Y ->  ]
                   Monitor Unit/Port:  [  /23 ]

                         Unit/Port X:  [  /25 ]
                         Unit/Port Y:  [  /24 ]

                           Address A:  [ 00-00-00-00-00-00 ]
                           Address B:  [ 00-00-00-00-00-00 ]



Port mirroring configuration has taken effect.

                  Currently Active Port Mirroring Configuration
                  ---------------------------------------------
Monitoring Mode:  -> Port X   or    Port Y ->    Monitor Port: 23
Port X: 25     Port Y: 24

Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Address-based mirroring configuration

Figure 54 shows an example of an address-based mirroring configuration where port 23, the designated monitor port for Switch S1, is monitoring traffic occurring between address A and address B.

Figure 54 Address-based mirroring configuration example



In this configuration, the designated monitor port (port 23) can be set to monitor traffic in any of the following modes:

- Monitor all traffic transmitted from address A to any address.
- Monitor all traffic received by address A from any address.
- Monitor all traffic received by or transmitted by address A.
- Monitor all traffic transmitted by address A to address B.
- Monitor all traffic between address A and address B (conversation between the two stations).

Figure 55 shows the Port Mirroring Configuration screen setup for this example.

In this example, port 23 becomes the designated Monitor Port for Switch S1 when you press Enter in response to the [Yes] screen prompt.

Note: The screen data displayed at the bottom of the screen changes to show the *new* currently active port mirroring configuration *after* you press Enter.

The Monitoring Mode field [Address A -> Address B] indicates that all traffic transmitted by address A to address B will be monitored by the StackProbe attached to Monitor Port 23.

Note: When you enter MAC addresses in this screen, they are also displayed in the MAC Address Table screen (see "MAC Address Table screen" on page 138).

Figure 55 Port Mirroring Configuration address-based screen example

```
                        Port Mirroring Configuration


                    Monitoring Mode:  [  Address A    ->   Address B  ]
                  Monitor Unit/Port:  [  /23 ]

                        Unit/Port X:  [  /   ]
                        Unit/Port Y:  [  /   ]

                          Address A:  [ 00-44-55-44-55-22 ]
                          Address B:  [ 00-33-44-33-22-44 ]

Is your port mirroring configuration complete?   [ Yes ]



                 Currently Active Port Mirroring Configuration
                 ---------------------------------------------
Monitoring Mode:  -> Address A   or    Address B ->    Monitor Port: 23
Port X: 25     Port Y: 24

Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Port mirroring configuration rules

The following configuration rules apply to any port mirroring configuration:

- You cannot configure a monitor port as a trunk member or IGMP member.
- A monitor port cannot be used for normal switch functions.
- When you configure a port as a monitor port, the port is automatically disabled from participating in the spanning tree. When you reconfigure the port as a standard switch port (no longer a monitor port), the port is enabled for spanning tree participation.
- When you create a *port-based* port mirroring configuration, be sure that the monitor port and both of the mirrored ports, port X and port Y, have the same configuration. Use the VLAN Configuration screen to configure the VLAN (see "VLAN Configuration Menu screen" on page 154).
- VLAN configuration settings for any ports configured for port-based mirroring cannot be changed. Use the Port Mirroring Configuration screen to disable port mirroring (or reconfigure the port mirroring ports), then change the VLAN configuration settings.
- For port-based monitoring of traffic, use one of the following modes for monitoring broadcast, IP Multicast, or unknown DA frames:
  - Monitor all traffic received by port X.
  - Monitor all traffic transmitted by port X.
  - Monitor all traffic received and transmitted by port X.
  - Monitor all traffic received by port X or transmitted by port Y.

For more information about using the Port Mirroring feature, see "Rate Limiting Configuration screen" on page 183.

See also Appendix E, "Quick steps to features," on page 275 for configuration flowcharts that can help you use this feature.

Chapter 3
Using the console interface

This chapter describes how to configure and manage the Business Policy Switch using the menu-driven console interface (CI).

This chapter covers the following topics:

- Accessing the CI menus and screens
- Using the CI menus and screens
- Description of options available from the main menu

Accessing the CI menus and screens

You can access the CI menus and screens locally through a console terminal attached to your Business Policy Switch, remotely through a dial-up modem connection, or in-band through a Telnet session (see “Console port” on page 30). You can connect your console cable into any unit in a Business Policy Switch-only stack for a unified stack interface. For the mixed stack management functions to become fully operational, you must connect your console terminal into a Business Policy Switch port within your mixed stack.

Note: If you have a properly configured BootP server in your network, it detects the IP address; you will not need to configure the IP address.

For information about SNMP, see your network management documentation.

Using the CI menus and screens

The CI menus and screens provide options that allow you to configure and manage Business Policy Switches. Help prompts at the bottom of each menu and screen explain how to enter data in the highlighted field and how to navigate the menus and screens.

The Console Port default settings are: 9600 baud with eight data bits, one stop bit, and no parity as the communications format, with flow control set to disabled.

Some options allow you to toggle among several possible values; other options allow you to set or modify a parameter.

Navigating the CI menus and screens

Use the following methods to navigate the CI menus and screens.

To select a menu option:

1. Use the arrow keys to highlight the option name.
2. Press [Enter].

   The option takes effect immediately after you press [Enter].

   Alternatively, you can press the key corresponding to the underlined letter in the option name. For example, to select the Switch Configuration option in the main menu, press the w key. Note that the text characters are not case-sensitive.

To toggle between values in a form:

1. Use the spacebar to highlight the value.
2. Press [Enter].

To clear a string field:

1. Position the cursor in the string field.
2. Press [Ctrl]-K.

To return to the previous menu, press [Ctrl]-R.

To go to the next screen in a series, press [Ctrl]-N.

To return to the main menu at any time, press [Ctrl]-C.

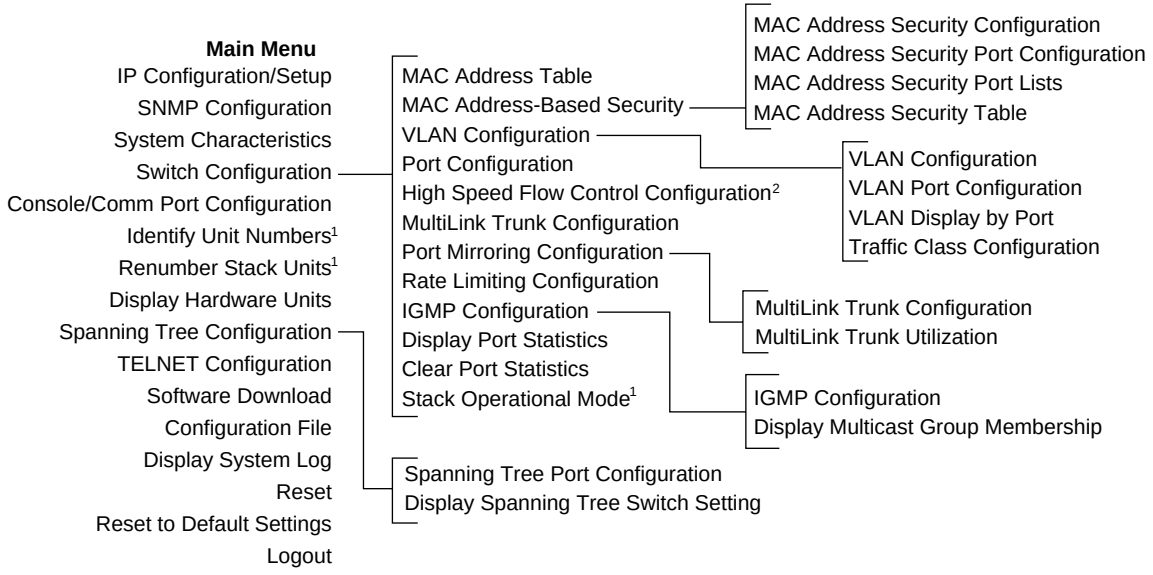
Press [Backspace] to delete entered text.

Options that appear in brackets (for example, [Enabled]) are user-settable options.

Screen fields and descriptions

Figure 56 shows a map of the CI screens. The remainder of this chapter describes the CI screens and their fields, beginning with the main menu.

Figure 56 Map of console interface screens



[1] Only appears when the switch is participating in a stack configuration.
[2] Only appears when a gigabit MDA is installed in one or more units in a stack configuration.

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The CI screens for your specific switch model will show the correct model name in the main menu screen title and the correct number of ports and port types in the Port Configuration screen.

Note: The field values shown in the CI screens in this section are provided as examples only.

Main Menu

This section describes the options available from the CI main menu (Figure 57). The CI screens and submenus for these options are described in the following sections.

Note: Some menu options shown in this main menu example and in other screen examples in this chapter may not appear on your screen, depending on the switch options installed. However, the full menu options are shown in the screen examples and described in the following sections.

Figure 57 Console interface main menu

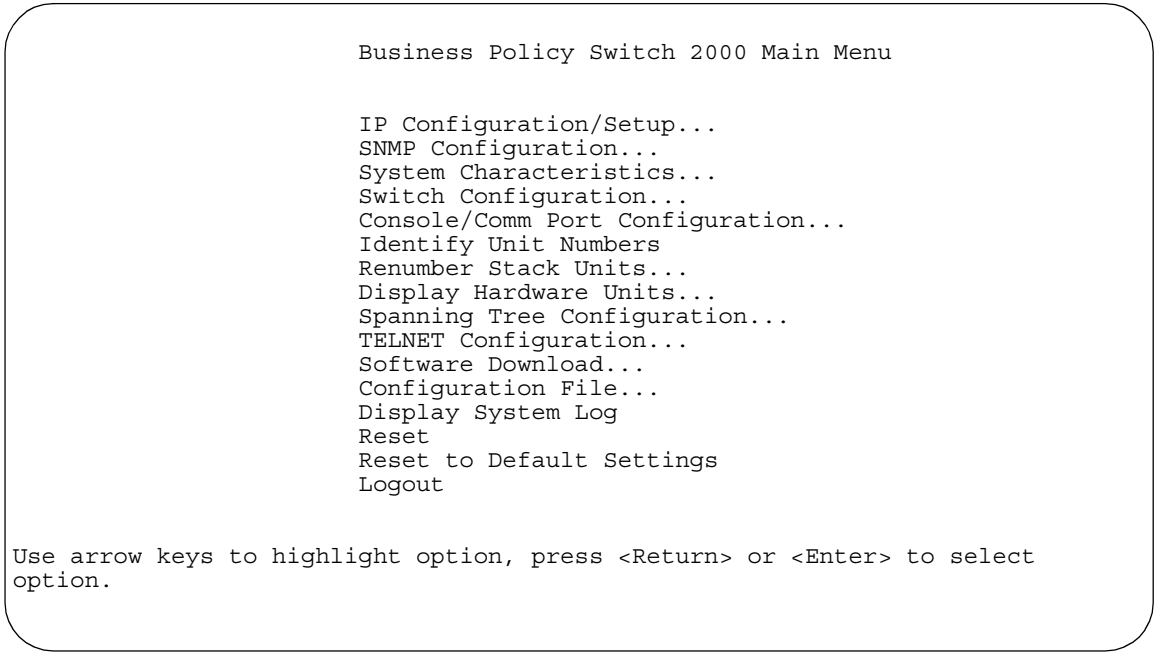


Table 10 describes the CI main menu options.

Table 10 Console interface Main Menu options

Option	Description
IP Configuration/ Setup...	Displays the IP Configuration/Setup screen (see "IP Configuration/Setup screen" on page 126). This screen allows you to set or modify IP configuration parameters.
SNMP Configuration...	Displays the SNMP Configuration screen (see "SNMP Configuration screen" on page 131). This screen allows you to set or modify the SNMP read-only community and read-write community strings, enable or disable the authentication trap and the link Up/down trap, set the IP address of trap receivers, and set the trap community strings.
System Characteristics...	Displays the System Characteristics screen (see "System Characteristics screen" on page 133). This screen allows you to view switch characteristics, including number of resets, power status, hardware and firmware version, and MAC address. This screen also contains three user-configurable fields: sysContact, sysName, and sysLocation. When the switch is part of a stack configuration, this screen also displays the base unit identification, the number of units configured in the stack, and the local unit stack number.

Table 10 Console interface Main Menu options (continued)

Option	Description
Switch Configuration...	Displays the Switch Configuration Menu screen (see "Switch Configuration Menu screen" on page 135). This menu provides the following configuration options: MAC Address Table, MAC Address-Based Security, VLAN Configuration, Port Configuration, MultiLink Trunk Configuration, Port Mirroring Configuration, Rate Limiting Configuration, IGMP Configuration, Display Port Statistics, Clear All Port Statistics, Display System Log, and Stack Operational Mode.
Console/Comm Port Configuration...	Displays the Console/Comm Port Configuration screen (see "Console/Comm Port Configuration screen" on page 200). This screen allows you to configure and modify the console/Comm port parameters, including the console port speed and password settings for the switch and stack operation.
Spanning Tree Configuration...	Displays the Spanning Tree Configuration Menu (see "Spanning Tree Configuration Menu screen" on page 209). This menu provides the following options: Spanning Tree Port Configuration, Display Spanning Tree Switch Settings.
TELNET Configuration...	Displays the TELNET Configuration screen (see "TELNET Configuration screen" on page 217). This screen allows you to set your switch to enable a user at a remote console terminal to communicate with the Business Policy Switch as if the console terminal were directly connected to it. You can have up to four active Telnet sessions running at one time in either a standalone switch or a stack configuration.
Software Download...	Displays the Software Download screen (see "Software Download screen" on page 219). This screen allows you to revise the Business Policy Switch software image that is located in nonvolatile flash memory.
Configuration File	Displays the Configuration File Download/Upload screen (see "Configuration File Download/Upload screen" on page 223). This screen allows you to store your switch/stack configuration parameters on a TFTP server. You can retrieve the configuration parameters for automatically configuring a replacement switch or stack with the same configuration when required.
Display System Log	Displays the System Log screen (see "System Log screen" on page 197.
Reset	Resets the switch with the current configuration settings. This option is followed by a screen prompt that precedes the action. Enter Yes to reset the switch; enter No to abort the option: • If the switch is participating in a stack configuration, additional prompts allow you to choose to reset a specific unit in the stack or the entire stack. • When you select this option, the switch resets, runs a self-test, then displays the Nortel Networks logo screen. Press [Ctrl]-Y to access the Business Policy Switch main menu.

Table 10 Console interface Main Menu options (continued)

Option	Description
Reset to Default Settings	Resets the switch to the factory default configuration settings. This option is followed by a screen prompt that precedes the action. Enter Yes to reset the switch to the factory default configuration settings; enter No to abort the option: • If the switch is participating in a stack configuration, additional prompts allow you to choose to reset a specific unit in the stack or the entire stack. • When you select this option, the switch resets, runs a self-test, then displays the Nortel Networks logo screen. Press [Ctrl]-Y to access the Business Policy Switch main menu.
	Caution: If you choose the Reset to Default Settings option, all of your configured settings will be replaced with factory default settings when you press [Enter]
	Achtung: Bei Auswahl des Befehls zur Rücksetzung auf die Standardeinstellungen werden alle von Ihnen konfigurierten Einstellungen durch die werkseitigen Standardeinstellungen ersetzt, wenn Sie die Eingabetaste drücken.
	Attention: Si vous restaurez la configuration usine, votre configuration courante sera remplacée par la configuration usine dès que vous appuierez sur [Entrée].
	Precaución: Si selecciona el comando Restaurar valores predeterminados, todos los valores de configuración se sustituirán por las valores predeterminados en fábrica al pulsar [Intro].
	Attenzione: Nel caso in cui si selezioni la reimpostazione dei valori di default, tutte le impostazioni configurate verranno sostituite dai default di fabbrica premendo il tasto [Invio].
	注意: 「デフォルトの設定にリセット」コマンドを選択すると、現在のコンフィグレーションされた設定は、[Enter]を押したとき、工場出荷時の設定に変更されます。
Logout	Allows a user in a Telnet session or a user working at a password-protected console terminal to terminate the session.

IP Configuration/Setup screen

The IP Configuration/Setup screen (Figure 58) allows you to set or modify the Business Policy Switch IP configuration parameters. Data that you enter in the user-configurable fields takes effect as soon as you press [Enter].

To open the IP Configuration/Setup screen:

➨ Choose IP Configuration/Setup (or press i) from the main menu.

Figure 58 IP Configuration/Setup screen

```
                        IP Configuration/Setup

                    BootP Request Mode:   [ BootP When Needed     ]

                                Configurable      In Use          Last BootP
                                ---------------  ------------     ---------------
In-Band Stack IP Address:       [10.30.31.108]    10.30.31.108    0.0.0.0
In-Band Switch IP Address:      [10.30.31.106]                    0.0.0.0
In-Band Subnet Mask:            [255.255.255.0]   255.255.255.0   0.0.0.0

Default Gateway:                [ 0.0.0.0 ]       0.0.0.0         0.0.0.0


Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 11 describes the IP Configuration/Setup screen fields.

Note: The read-only fields in this screen are updated based on the BootP mode specified in the BootP Request Mode field. (See “Choosing a BootP request mode” on page 128 for more information.)

Table 11 IP Configuration/Setup screen fields

Field	Description
BootP Request Mode	One of four modes of operation for BootP. (See "Choosing a BootP request mode" on page 128 for details about the four modes.) Default Value: BootP Disabled Range: BootP Disabled, BootP When Needed, BootP Always, BootP or Last Address
Configurable	Column header for the user-configurable IP configuration fields in this screen.
In Use	Column header for the read-only fields in this screen. The read-only data displayed in this column represents IP configuration that is currently in use.
Last BootP	Column header for the read-only fields in this screen. The read-only data displayed in this column represents IP configuration obtained from the last BootP reply received.
In-Band Stack IP Address	The in-band *stack* IP address field. This field is not required for the operation of the standalone switch. Default Value: 0.0.0.0 (no IP address assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, between 0 and 255, separated by a decimal point
In-Band Switch IP Address	The in-band IP address of the switch. This field is not required for the operation of the stack. This field can not use the same IP address used for the stack. Default Value: 0.0.0.0 (no IP address assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, between 0 and 255, separated by a decimal point **Note:** When the IP address is entered in the In-Band IP Address field, and the In-Band Subnet Mask field value is not present, the software provides an *in-use* default value for the In-Band Subnet Mask field that is based on the class of the IP address entered in the In-Band IP Address field.

Table 11 IP Configuration/Setup screen fields (continued)

Field	Description
In-Band Subnet Mask	The subnet address mask associated with the in-band IP address shown on the screen (see In-Band Switch IP address field). Network routers use the subnet mask to determine the network or subnet address portion of a host's IP address. The bits in the IP address that contain the network address (including the subnet) are set to 1 in the address mask, and the bits that contain the host identifier are set to 0. Default Value 0.0.0.0 (no subnet mask assigned) Range Four-octet dotted-decimal notation, where each octet is represented as a decimal value, between 0 and 255, separated by a decimal point
Default Gateway	The IP address of the default gateway. Default Value 0.0.0.0 (no IP address assigned) Range Four-octet dotted-decimal notation, where each octet is represented as a decimal value, between 0 and 255, separated by a decimal point

Choosing a BootP request mode

The BootP Request Mode field in the IP Configuration screen allows you to choose which method the switch uses to broadcast BootP requests:

- BootP When Needed
- BootP Always
- BootP Disabled
- BootP or Last Address

Note: Whenever the switch is broadcasting BootP requests, the BootP process will eventuall time out if a reply is not received. When the process times out, the BootP request mode automatically changes to BootP Disabled mode. To restart the BootP process, change the BootP request mode to any of the three following modes:

- BootP When Needed
- BootP Always
- BootP or Last Address.

BootP When Needed

Allows the switch to request an IP address if one has not already been set from the console terminal. When selected, this mode operates as follows:

- When the IP data is entered from the console terminal, the data becomes the in-use address of the switch and BootP requests are not broadcast. The switch can be managed using this in-band IP address.
- When the in-band IP address is not set from the console terminal, the switch broadcasts BootP requests until it receives a BootP reply containing an IP address. If the switch does not receive a BootP reply that contains an IP address, the switch cannot be managed in-band.

If an IP address is *not* currently in use, these actions take effect immediately. If an IP address *is* currently in use, these actions take effect only after the switch is reset or power cycled.

BootP Always

Allows the switch to be managed only when configured with the IP address obtained from the BootP server. When selected, this mode operates as follows:

- The switch continues to broadcast BootP requests, regardless of whether an in-band IP address is set from the console terminal.
- If the switch receives a BootP reply that contains an in-band IP address, the switch uses this new in-band IP address.
- If the switch does not receive a BootP reply, the switch cannot be managed using the in-band IP address set from the console terminal.

If an IP address is *not* currently in use, these actions take effect immediately. If an IP address *is* currently in use, these actions take effect only after the switch is reset or power cycled.

BootP Disabled

Allows the switch to be managed only by using the IP address set from the console terminal. When selected, this mode operates as follows:

- The switch does not broadcast BootP requests, regardless of whether an IP address is set from the console terminal.
- The switch can be managed only by using the in-band switch IP address set from the console terminal.

These actions take effect after the switch is reset or power cycled, even if an IP address is not currently in use.

BootP or Last Address

Allows the switch to be managed even if a BootP server is not reachable. When selected, this mode operates as follows:

- When the IP data is entered from the console terminal, the data becomes the in-band address of the switch and BootP requests are not broadcast. The switch can be managed using this in-band IP address.
- When the in-band IP address is not set from the console terminal, the switch broadcasts BootP requests until it receives a BootP reply containing an in-band IP address. If the switch does not receive a BootP reply that contains an in-band IP address within 10 minutes, the switch uses the last in-band IP address it received from a BootP server. This IP information is displayed in the Last BootP column.

If an IP address is *not* currently in use, these actions take effect immediately. If an IP address *is* currently in use, these actions take effect only after the switch is reset or power cycled.

SNMP Configuration screen

The SNMP Configuration screen (Figure 59) allows you to set or modify the SNMP configuration parameters.

To open the SNMP Configuration screen:

➡ Choose SNMP Configuration (or press m) from the main menu.

Figure 59 SNMP Configuration screen

```
                              SNMP Configuration


       Read-Only Community String:    [ public ]
       Read-Write Community String:   [ private ]

       Trap #1 IP Address:            [ 0.0.0.0 ]
               Community String:      [ ]

       Trap #2 IP Address:            [ 0.0.0.0 ]
               Community String:      [ ]

       Trap #3 IP Address:            [ 0.0.0.0 ]
               Community String:      [ ]

       Trap #4 IP Address:            [ 0.0.0.0 ]
               Community String:      [ ]


       Authentication Trap:           [ Enabled  ]
       AutoTopology:                  [ Enabled  ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 12 describes the SNMP Configuration screen fields.

Table 12 SNMP Configuration screen fields

Field	Description
Read-Only Community String	The community string used for in-band read-only SNMP operations. Default Value public Range Any ASCII string of up to 32 printable characters
Read-Write Community String	The community string used for in-band read-write SNMP operations. Default Value private Range Any ASCII string of up to 32 printable characters
Trap #1 IP Address[1]	Number one of four trap IP addresses. Successive trap IP address fields are numbered 2, 3, and 4. Each trap address has an associated community string (see Community String). Default Value 0.0.0.0 (no IP address assigned) Range Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
Community String	The community string associated with one of the four trap IP addresses (see Trap #1 IP Address). Default Value Zero-length string Range Any ASCII string of up to 32 printable characters
Authentication Trap	Determines whether a trap will be sent when there is an SNMP authentication failure. Default Value Enabled Range Enabled, Disabled
Autotopology	Allows you to enable or disable the switch participation in autotopology, which allows network topology mapping of other switches in your network. Default Value Enabled Range Disabled

1 The Trap IP Address and Community String fields can be set using a MIB table (in a Nortel Networks proprietary MIB). The status of the row in the MIB table can be set to Ignore. If the row status is set to Ignore, the fields appear to be set when viewed from the console terminal; however, no traps will be sent to that address until the row status is set to Valid.

System Characteristics screen

The System Characteristics screen (Figure 60) allows you to view system characteristics and contains three user-configurable fields: sysContact, sysName, and sysLocation.

To open the System Characteristics screen:

➨ Choose System Characteristics (or press s) from the main menu.

Figure 60 System Characteristics screen

```
                          System Characteristics

Operation Mode:    Stack, Unit # 1
Size Of Stack:     2
Base Unit:         1

MAC Address:       00-80-2C-8D-23-DF

Reset Count:       16
Last Reset Type:   Management Reset
Power Status:      Primary Power
Local MDA Type:    None
sysDescr:          BPS2000 HW:AB3 FW:V0.XX SW:v1.0.X.X ISVN: 1
sysObjectID:       1.3.6.1.4.1.45.3.40.1
sysUpTime:         0 days, 0:11:3
sysServices:       3
sysContact:        [  ]
sysName:           [  ]
sysLocation:       [  ]


Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 13 describes the System Characteristics screen fields.

Table 13 System Characteristics screen fields

Field	Description
Operation Mode	Read-only field that indicates the operation mode of the unit, for example: • When the unit is part of a stack configuration, the (read-only) field indicates the unit is operational in a stack, and lists the current unit number of this switch. In this example (see Figure 60 on page 133), the current unit number is Unit 2. • When the unit is *not* part of a stack configuration (operating standalone), the read-only field indicates the unit is operating as a switch. When in this operation mode, the Size of Stack and Base Unit fields (see following description) do not appear.
Size of Stack	This read-only field only appears when the switch is participating in a stack configuration. This field indicates the number of units configured in the stack configuration (1 to 8 units maximum).
Base Unit	This read-only field only appears when the switch is participating in a stack configuration. This field indicates the unit number of the switch that is currently operating as the base unit.
MAC Address	The MAC address of the switch or, when the switch is participating in a stack configuration, the MAC address of the stack configuration.
Reset Count	A read-only field that indicates the number of resets since the operational firmware was first loaded on the switch. Default Value 1 Range 0 to 2^{32} -1 (4,294,967,295)
Last Reset Type	A read-only field that indicates the last type of reset. Default Value Power Cycle Range Power Cycle, Software Download, Management Reset, Management Factory Reset
Power Status	A read-only field that indicates the current power source (primary, RPSU, or both). Default Value Primary Power Range Primary Power, Redundant Power, Primary and Redundant Power
Local MDA Type	A read-only field that indicates the MDA type that is configured in this unit.
sysDescr	A read-only field that specifies hardware and software versions.
sysObjectID	A read-only field that provides a unique identification of the switch, which contains the vendor's private enterprise number.
sysUpTime	A read-only field that shows the length of time since the last reset. Note that this field is updated when the screen is redisplayed.
sysServices	A read-only field that indicates the switch's physical and data link layer functionality.

Table 13 System Characteristics screen fields (continued)

Field	Description
sysContact	The name and phone number of the person responsible for the switch. Default Value Zero-length string Range Any ASCII string of up to 56 printable characters[1]
sysName	A name that uniquely identifies the switch. Default Value Zero-length string Range Any ASCII string of up to 56 printable characters[1]
sysLocation	The physical location of the switch. Default Value Zero-length string Range Any ASCII string of up to 56 printable characters

1 Although this field can be set to up to 255 characters from a Network Management Station (NMS), only 56 characters are displayed on the console terminal.

Switch Configuration Menu screen

The Switch Configuration Menu screen (Figure 61) allows you to set or modify your switch configuration.

Note: The High Speed Flow Control Configuration option only appears when an optional Gigabit MDA is installed.

Choose Switch Configuration (or press w) from the main menu to open the Switch Configuration Menu screen (Table 14).

Figure 61 Switch Configuration Menu screen

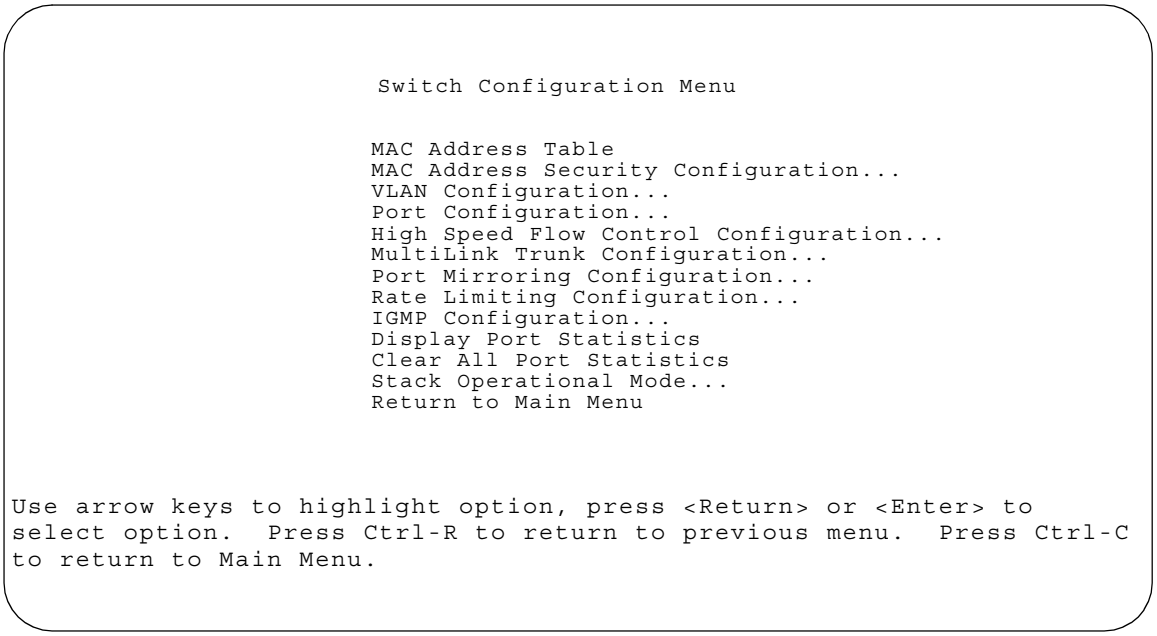

Switch Configuration Menu
MAC Address Table
MAC Address Security Configuration...
VLAN Configuration...
Port Configuration...
High Speed Flow Control Configuration...
MultiLink Trunk Configuration...
Port Mirroring Configuration...
Rate Limiting Configuration...
IGMP Configuration...
Display Port Statistics
Clear All Port Statistics
Stack Operational Mode...
Return to Main Menu
Use arrow keys to highlight option, press <Return> or <Enter> to select option. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 14 describes the Switch Configuration Menu screen options.

Table 14 Switch Configuration Menu screen options

Option	Description
MAC Address Table	Displays the MAC Address Table screen (see "MAC Address Table screen" on page 138). This screen allows you to view all MAC addresses and their associated port or trunk that the switch has learned, or to search for a particular MAC address (to see if the switch has learned the address).
MAC Address Security Configuration...	Displays the MAC Address Security Configuration menu (see "MAC Address Security Configuration Menu screen on page 141). This screen allows you to set up the MAC address security feature and provides the following options: MAC Address Security Configuration, MAC Address Security Port Configuration, MAC Address Security Port Lists, and MAC Address Security Table. This menu allows you to enable and disable security features on the port and trunk levels.

Table 14 Switch Configuration Menu screen options (continued)

Option	Description
VLAN Configuration...	Displays the VLAN Configuration Menu (see "VLAN Configuration Menu screen" on page 154). This menu provides the following options: VLAN Configuration, VLAN Port Configuration, VLAN Display by Port, MAC-SA, and Return to Switch Configuration Menu screen. This menu allows you to create and modify VLANs.
Port Configuration...	Displays the Port Configuration screen (see "Port Configuration screen" on page 167). This screen allows you to configure a specific switch port, all switch ports or, when in a stack configuration, all stack ports.
High Speed Flow Control Configuration...	Only appears when an optional Gigabit MDA is installed in the Uplink Module slot. When the Gigabit MDA is installed, selecting this option displays the High Speed Flow Control Configuration screen (see "MultiLink Trunk Configuration Menu screen" on page 173).
MultiLink Trunk Configuration...	Displays the MultiLink Trunk Configuration Menu (see "MultiLink Trunk Configuration Menu screen" on page 173). This menu provides the following options: MultiLink Trunk Configuration, MultiLink Trunk Utilization, and Return to Switch Configuration Menu screen. This menu allows you to create and modify trunks, and to monitor the bandwidth utilization of configured trunks.
Port Mirroring Configuration...	Displays the Port Mirroring Configuration screen (see "Port Mirroring Configuration screen" on page 180). This screen allows you to designate a single switch port as a traffic monitor for up to two specified ports or addresses.
Rate Limiting Configuration...	Displays the Rate Limiting Configuration screen (see "Rate Limiting Configuration screen" on page 183). This screen allows you to limit the forwarding rate of broadcast and multicast packets.
IGMP Configuration...	Displays the IGMP Configuration screen (see "IGMP Configuration screen" on page 188). This screen allows you to optimize multicast traffic by setting up IGMP port memberships that filter multicast on a per port basis (see "IGMP snooping" on page 89 for more information about this feature).
Display Port Statistics	Displays the Port Statistics screen (see "Port Statistics screen" on page 193). This screen allows you to view detailed information about any switch port.

Table 14 Switch Configuration Menu screen options (continued)

Option	Description

Clear All Port Statistics	Allows you to clear all port statistics.
	This option is followed by screen prompts that precede a choice of the actions:
	• If the switch is operating *standalone*, choose one of the following:
	  • Yes, to clear all port statistics for all switch ports
	  • No, to abort the option
	• If the switch is *participating in a stack configuration*, choose one of the following:
	  • Clear all port statistics for a specific unit in the stack
	  • Clear all port statistics for the entire stack
	  • No, to abort the option

Display System Log	In a stack environment, displays the system log screen, which provides information obtained through volatile or nonvolatile RAM. See "System Log screen" on page 197.
Stack Operational Mode	Displays the stack operational mode screen, which provides information about the types of switches in your stack. See "Stack Operational Mode screen" on page 199 for details. • The Pure BPS 2000 Stack Mode field indicates that your stack contains only Business Policy Switches. • The Hybrid Stack Mode field indicates that your stack consists of switches other than, or in addition to, Business Policy Switch(es).

MAC Address Table screen

The MAC Address Table screen (Figure 62) allows you to view MAC addresses that the switch has discovered or to search for a specific MAC address.

The MAC Address Table screen also operates in conjunction with the Port Mirroring Configuration screen. When you configure a switch for MAC address-based port mirroring, you can use the MAC Address Table screen to find an address and enter the address directly from this screen. You can enter addresses from either screen, but you must return to the Port Mirroring Configuration screen to activate the feature (see "Port Mirroring Configuration screen" on page 180).

Choose MAC Address Table (or press m) from the Switch Configuration Menu screen to open the MAC Address Table screen (Figure 62).

Note: This screen does not refresh dynamically to show new entries. To refresh the screen, press [Ctrl]-R to return to the previous menu.

Figure 62 MAC Address Table screen

```
                          MAC Address Table

               Aging Time:           [ 300 seconds ]
               Find an Address:      [ 00-00-00-00-00-00 ]
          Port Mirroring Address A:  [ 00-44-55-44-55-22 ]
          Port Mirroring Address B:  [ 00-33-44-33-22-44 ]



00-60-FX-00-02-30
00-00-AX-85-2X-26    Port: 1
00-60-XX-12-02-15    Port: 1
00-08-FX-1D-4X-38              Trunk:3




End of Address Table.  Press Ctrl-P to see previous display.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 15 describes the MAC Address Table screen fields.

Table 15 MAC Address Table screen fields

Field	Description
Aging Time	Specifies how long a learned MAC address remains in the switch's forwarding database. If an entry is inactive for a period of time that exceeds the specified aging time, the address is removed. Default Value 300 seconds Range 10 to 1,000,000 seconds
Find an Address	Allows the user to search for a specific MAC address. Default Value 00-00-00-00-00-00 (no MAC address assigned) Range 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF
Port Mirroring Address A	Only appears when you select any of the five *address-based* monitoring modes from the Port Mirroring Configuration screen. When you enter a MAC address in this field, it is also configured into the Port Mirroring Configuration screen. Conversely, when you enter the MAC address from the Port Mirroring Configuration screen, it also displays in this screen. See "Port Mirroring Configuration screen" on page 180 for more information. Default Value 00-00-00-00-00-00 (no MAC address assigned) Range 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF
Port Mirroring Address B	Only appears when you select any of the two *address-based* monitoring modes that use Address B from the Port Mirroring Configuration screen. When you enter a MAC address in this field, it is also configured into the Port Mirroring Configuration screen. Conversely, when you enter the MAC address from the Port Mirroring Configuration screen, it also displays in this screen. See"Port Mirroring Configuration screen " on page 180 for more information. Default Value 00-00-00-00-00-00 (no MAC address assigned) Range 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF

MAC Address Security Configuration Menu screen

The MAC Address Security Configuration Menu screen (Figure 63) allows you to specify a range of system responses to unauthorized network access to your switch. The system response can range from sending a trap to disabling the port. The network access control is based on the MAC addresses of the authorized stations. You can specify a list of up to 448 MAC addresses that are authorized to access the switch. You can also specify the ports that each MAC address is allowed to access. The options for allowed port access include: NONE, ALL, and single or multiple ports that are specified in a list, for example, 1-4, 6, 9, etc. You must also include the MAC address of any router connected to any secure ports.

When the switch software detects a security violation, the response can be to send a trap, turn on destination address (DA) filtering, disable the specific port, or any combination of these three options.

To open the MAC Address Security Configuration screen:

- Choose MAC Address Security Configuration from the Switch Configuration Menu.

Figure 63 MAC Address Security Configuration Menu screen

```
                  MAC Address Security Configuration Menu



                 MAC Address Security Configuration...
                 MAC Address Security Port Configuration...
                 MAC Address Security Port Lists...
                 MAC Address Security Table...
                 Return to Switch Configuration Menu


Use arrow keys to highlight option, press <Return> or <Enter> to select
option.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

Table 16 describes the MAC Address Security Configuration Menu options.

MAC Address Security Configuration screen

Table 16 MAC Address Security Configuration Menu Options

Option	Description
MAC Address Security Configuration...	Displays the MAC Address Security Configuration screen (see "MAC Address Security Configuration screen" on page 142). This screen allows you to Enable or Disable the MAC Address Security feature.
MAC Address Security Port Configuration...	Displays the MAC Address Security Port Configuration screen (see "MAC Address Security Port Configuration screen" on page 145"). This screen allows you to Enable or Disable MAC Security for each port.
MAC Address Security Port Lists...	Displays the MAC Address Security Port Lists screen (see "MAC Address Security Port Lists screens" on page 147). This screen allows you to create port lists that can be used as an *allowed source port list* for a MAC address in the MAC Address Security Table screen.
MAC Address Security Table...	Displays the MAC Address Security Table screen (see "MAC Address Security Table screens" on page 152). This screen allows you to specify the MAC addresses that are allowed to access the switch.
Return to Switch Configuration Menu...	Exits the MAC Address Security Configuration Menu screen and displays the Switch Configuration Menu screen.

The MAC Address Security Configuration screen (Figure 64) allows you to enable or disable the MAC address security feature and to specify the appropriate system responses to any unauthorized network access to your switch.

Choose MAC Address Security Configuration from the MAC Address Security Configuration Menu to open the MAC Address Security Configuration screen.

Figure 64 MAC Address Security Configuration screen

```
                  MAC Address Security Configuration

      MAC Address Security:                              [ Disabled ]
      MAC Address Security SNMP-Locked:                  [ Disabled ]
      Partition Port on Intrusion Detected:              [ Disabled ]

      DA Filtering on Intrusion Detected:                [ Disabled ]
      Generate SNMP Trap on Intrusion:                   [ Disabled ]

 MAC Security Table:

 Clear by Ports: [  ]
 Learn by Ports: [  ]
 Current Learning Mode:                    [ Disabled ]


Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 17 describes the MAC Address Security Configuration screen fields.

Table 17 MAC Address Security Configuration fields

Field	Description
MAC Address Security	When this field is set to enabled, the software checks source MAC addresses of packets that arrive on secure ports against MAC addresses listed in the MAC Address Security Table for allowed membership. If the software detects a source MAC address that is not an allowed member, the software registers a MAC intrusion event. Default Disabled Range Disabled, Enabled
MAC Address Security SNMP-Locked	When this field is set to enabled, the MAC address security screens cannot be modified using SNMP. Default Disabled Range Disabled, Enabled

Table 17 MAC Address Security Configuration fields (continued)

Field	Description
Partition Port on Intrusion Detected:	This field value determines how the switch reacts to an intrusion event. When an intrusion even is detected (see MAC Address Security field description) the specified switch port is set to Disabled (partitioned from other switch ports). When the field is set to: • Disabled - the port remains enabled, even if an intrusion event is detected. • Enabled - the port becomes disabled, then automatically resets to enabled depending on the value set in the Partition Time field. • Forever - the port becomes disabled, and remains disabled (partitioned). The Partition Time field cannot be used automatically reset the port to Enabled if you set this field to Forever. You can always manually set the port's status field to Enabled using the Port Configuration screen (see "Port Configuration screen" on page 167). Default Disabled Range Disabled, Enabled, Forever
Partition Time	This field appears only when the Partition Port on Intrusion Detected field is set to enabled. This field determines the length of time a partitioned port remains disabled. This field is not operational when the Partition Port on Intrusion Detected field is set to Forever. Default 0 seconds (the value 0 indicates forever) Range 0-65536 seconds
DA Filtering on Intrusion Detected:	When set to Enabled, this field isolates the intruding node by filtering (discarding) packets sent to that MAC address. Default Disabled Range Disabled, Enabled
Generate SNMP Trap on Intrusion	When set to enabled and a MAC intrusion event is detected, the software issues an SNMP trap message to all registered SNMP trap addresses (see "SNMP Configuration screen" on page 131). Default Disabled Range Disabled, Enabled

Table 17 MAC Address Security Configuration fields (continued)

Field	Description
Clear by Ports	This field clears the specified port (or ports) that are listed in the Allowed Source Port(s) field of the MAC Address Security Table screen (see "MAC Address Security Table screens" on page 152). When you specify a port (or ports) to be cleared using this field, the specific port (or ports) will be cleared for each of the entries listed in the MAC Address Security Table. If you totally clear the allowed Source Port(s) field (leaving a blank field) for an entry, the associated MAC address for that entry is also cleared. Default NONE Range NONE, ALL, a port number list (for example, 1/1, 2/6, etc.)
Learn by Ports	All source MAC addresses of any packets received on the specified port (or ports) are added to the MAC Security Table when the Current Learning Mode field is set to Learning in Progress. You cannot include any of the port values you have chosen for the secure ports field. Default NONE Range NONE, ALL, a port number list (for example, 1/1, 2/6, etc.)
Current Learning Mode	Indicates the current learning mode for the switch ports. When this field is set to Learning in Progress, all source MAC addresses of any packets received on the specified port (or ports) are added to the MAC Security Table (maximum of 448 MAC address entries allowed). If you exceed the limit of 448 entries, the system prompts you with an alert message. Default Not Learning Range Not Learning, Learning in Progress

MAC Address Security Port Configuration screen

The MAC Address Security Port Configuration screens (Figure 65 and Figure 66) allow you to set or modify your MAC address port security configuration on a perport basis.

To open the MAC Address Security Port Configuration screen:

➨ Choose MAC Address Security Port Configuration from the MAC Address Security Configuration Menu.

Figure 65 MAC Security Port Configuration screen (1 of 2)

```
                    MAC Security Port Configuration

   Port    Trunk      Security
   ----    -----    ------------
     1              [ Disabled ]
     2              [ Disabled ]
     3              [ Disabled ]
     4              [ Disabled ]
     5              [ Disabled ]
     6              [ Disabled ]
     7              [ Disabled ]
     8              [ Disabled ]
     9              [ Disabled ]
     10             [ Disabled ]
     11             [ Disabled ]
     12             [ Disabled ]
     13             [ Disabled ]
     14             [ Disabled ]

                                                          More...

Press Ctrl-N to display choices for additional ports..
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 66 MAC Security Port Configuration screen (2 of 2)

```
                    MAC Security Port Configuration

   Port    Trunk      Security
   ----    -----    ------------
     15             [ Disabled ]
     16             [ Disabled ]
     17             [ Disabled ]
     18             [ Disabled ]
     19             [ Disabled ]
     20             [ Disabled ]
     21             [ Disabled ]
     22             [ Disabled ]
     23             [ Disabled ]
     24             [ Disabled ]
 Switch             [ Enable   ]
 Stack              [ Enable   ]

Press Ctrl-P to display choices for ports 1-14.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 18 describes the MAC Security Port Configuration screen fields.

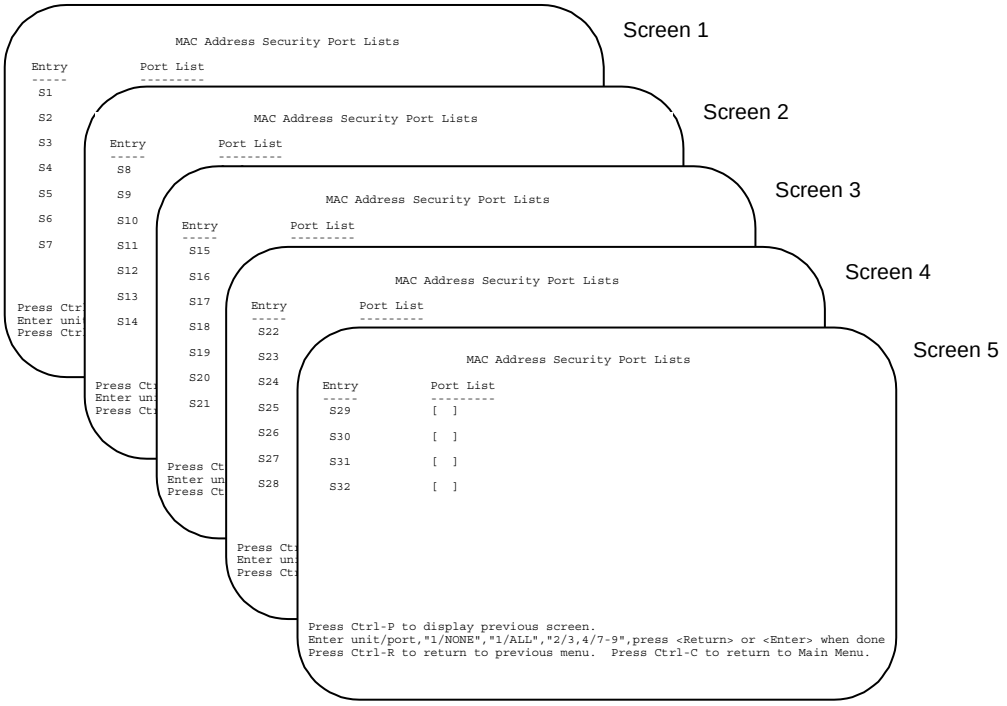
Table 18 MAC Security Port Configuration screen fields

Field	Description
Port	Displays a numbered port list.
Trunk	Displays the trunk number if the port is a member of that trunk. Default blank field
Security	This field value determines whether or not security is enabled or disabled on the port level or switch level. Default Disabled Range Disabled, Enabled

MAC Address Security Port Lists screens

The MAC Address Security Port Lists screens allow you to create port lists that can be used as *allowed source port lists* for a specified MAC address in the MAC Address Security Table screen. You can create as many as 32 port lists, using up to five MAC Address Security Port Lists screens (see Figure 67).

Figure 67 MAC Address Security Port Lists screens



To open the MAC Address Security Lists screen:

➨ Choose MAC Address Security Lists from the MAC Address Security Configuration Menu.

The options for allowed port access include: NONE, ALL, and ports that are specified in a list (for example, 1/1, 2/6, etc.). Refer to Port List syntax for more information.

Figure 68 MAC Address Security Port Lists screen

```
                    MAC Address Security Port Lists


    Entry              Port List
    -----              ---------
     S1                  [ 1/1-7,2/1-7,2/9,3/1-4,4/12 ]
     S2                  [ 2/1-7,2/9,4/3-5 ]
     S3                  [ 1/3,2/7,3/1-4 ]
     S4                  [ 4/12 ]
     S5                  [ 1/NONE,2/NONE,3/NONE,4/NONE ]
     S6                  [ 1/ALL,2/ALL,3/ALL,4/ALL ]
     S7                  [ 3/ALL ]
                                                  More...


Press Ctrl-N to display next screen.   PortT
Enter unit/port, "1/NONE", "1/ALL", "2/3,4/7-9".  Press <Return> or <Enter>
when done.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return
to Main Menu.
```

Table 19 describes the MAC Address Security Port Lists screen fields.

Table 19 MAC Address Security Port Lists screen fields

Field	Description
Entry	This field indicates the port list number (S1 to S32) that corresponds to the values you set in the Port List field.
Port List	This field allows you to create a port list that you can use as an "Allowed Source" in the MAC Address Security Table screen.

Port List Syntax

When you enter a port list in a stack configuration, you must specify either a unit/port list, NONE, or ALL. In a stack configuration, ALL indicates all of the stack port; whereas, in a standalone scenario, ALL indicates all of the switch ports.

Note: NONE and ALL must be entered in uppercase characters as shown in the screen prompt.

A unit/port number list is composed of one or more list items, each of which can be a single number or a range of numbers (where the numbers represents one or more ports). If a list item is preceded by a number and then a slash (/), the number represents a stack unit.

For example, 1/1-7,2/1-7,2/9,3/1-4,4/12 is a valid unit/port number list (see entry S1 in Figure 68 on page 149). It represents the following port order:

- Unit 1: ports 1 to 7
- Unit 2: ports 1 to 7 and port 9
- Unit 3: ports 1 to 4
- Unit 4: port 12

Accelerator keys for repetitive tasks

You can use certain keystrokes as “accelerator keys” to help speed up repetitive tasks. For example, suppose you want to modify the Port List field in the MAC Address Security Port List screen (Figure 68 on page 149). You can modify the port list in any of the following ways:

- Add a new port to an existing port number list.
- Remove a port from an existing port number list.
- Copy an existing field into an adjacent field.

Adding a new port to an existing port number list

In the example shown in Figure 68 on page 149, S3 shows the Port List field values as:

1/3,2/7,3/1-4

If you want to add another port (for example, port **2**/**9**) to the existing port number list, you could highlight the field and then type another port list, including the new port number 1/3,2/7,**2/9**,3/1-4 [Return]. This method can be cumbersome.

As an alternative method instead, you can highlight the field and then enter +2/9 [Return]. The existing field keeps the previous list and adds the new port number (2/9) between ports 2/7 and 3/14.

(If you choose to add port **2/8** to the existing port number list, the field accepts the new port **2/8** but shows the new port number list field as: 1/3,2/7-8,3/1-4.)

Removing a port from an existing port number list

To remove a port from the port number list, use the minus sign (-) character instead of the plus sign (+) character as described above.

Copying an existing field into and adjacent field

You can use the period (.) character to copy a previously entered field value into the field directly next to it. For example, to copy the Allowed Source S3 (shown in Figure 68 on page 149) into the next field (entry 6):

1. Enter a MAC address into the next MAC address field.
2. Highlight the (blank) Allowed Source field.
3. Enter the period (.) character and click Return.

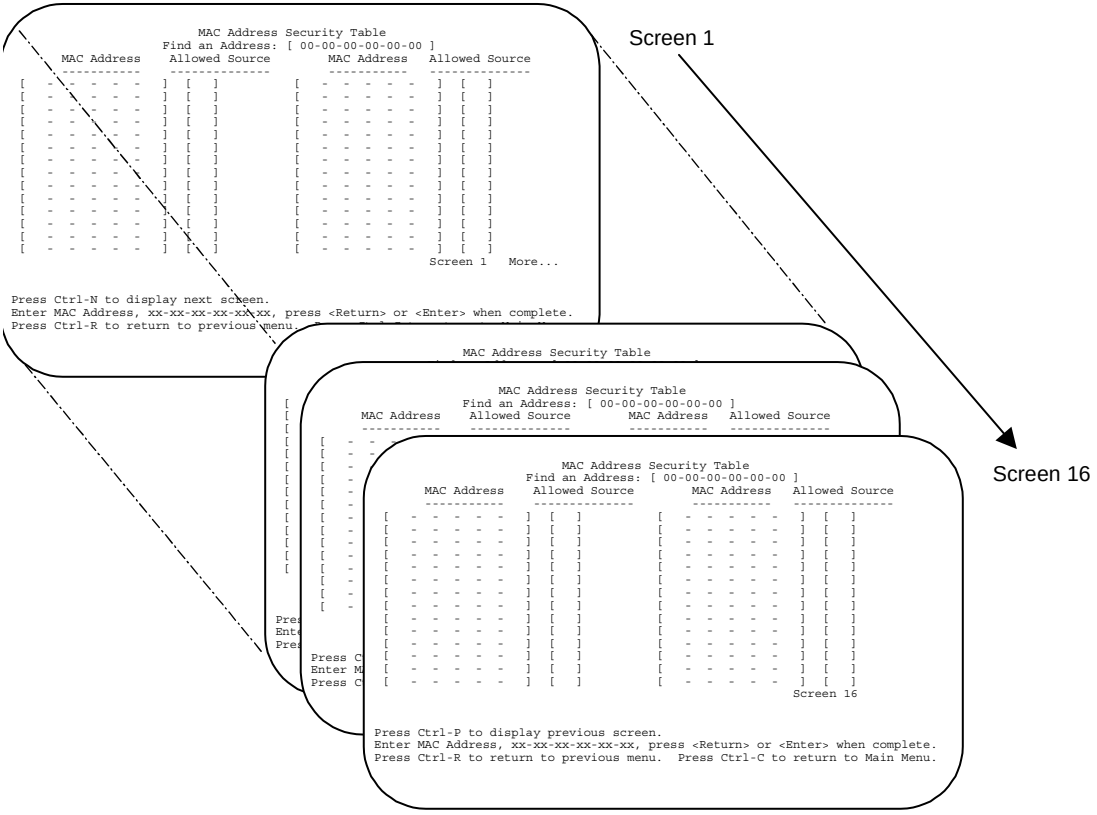
The port number list from the previous entry is copied into the new field.

MAC Address Security Table screens

The MAC Address Security Table screens allow you specify the ports that each MAC address is allowed to access. You must also include the MAC addresses of any routers that are connected to any secure ports.

There are 16 available MAC Address Security Table screens (Figure 69) that you can use to create up to 448 MAC address entries (28 per screen).

Figure 69 MAC Address Security Table screens


Screen 1
Screen 16
MAC Address Security Table
Find an Address: [00-00-00-00-00-00]
MAC Address
Allowed Source
Screen 1 More...
Press Ctrl-N to display next screen.
Enter MAC Address, xx-xx-xx-xx-xx-xx, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.
Screen 16
Press Ctrl-P to display previous screen.
Press Ctrl-C to return to Main Menu.

Choose MAC Address Security Table from the MAC Address Security Configuration Menu to open the MAC Address Security Table screen (Figure 70).

Figure 70 MAC Address Security Table screen

```
                    MAC Address Security Table

                    Find an Address:
       MAC Address     Allowed Source       MAC Address    Allowed Source
       -----------     --------------       -----------    --------------
 [ 44-33-22-44-55-44 ]   [ S1 ]           [   -  -  -  -  -  -   ]   [    ]
 [ 22-44-33-55-66-55 ]   [ S2 ]           [   -  -  -  -  -  -   ]   [    ]
 [ 22-55-33-44-33-22 ]   [ S3 ]           [   -  -  -  -  -  -   ]   [    ]
 [ 44-22-33-55-44-22 ]   [ S4 ]           [   -  -  -  -  -  -   ]   [    ]
 [ 22-33-44-55-33-44 ]   [ S3 ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
 [    -  -  -  -  -  ]   [    ]           [   -  -  -  -  -  -   ]   [    ]
                                                    Screen 1   More...


Press Ctrl-N to display next screen.  Enter MAC Address, xx-xx-xx-xx-xx-xx,
press <Return> or <Enter> when complete.  Press Ctrl-R to return to previous
menu.  Press Ctrl-C to return to Main Menu.
```

Table 20 describes the MAC Address Security Table screen fields.

Table 20 MAC Address Security Table Screen Fields

Field	Description
Find an Address	Allows you to search for a specific MAC address that is used in any of the MAC Address Security Table screens.
MAC Address	Allows you to specify up to 448 MAC addresses that are authorized to access the switch. You can specify the ports that each MAC address is allowed to access using the Allowed Source field (see next field description). The specified MAC address does not take effect until the Allowed Source field is set to some value (a single unit/port number or a port list value that you previously configured in the MAC Address Security Port Lists screen). You can clear an existing MAC address field by entering zero (0) in the field and pressing [Enter]. Default - - - - - - (no address assigned) Range A range of 6 Hex Octets, separated by dashes (multicast[1] and broadcast addresses are not allowed).

Table 20 MAC Address Security Table Screen Fields (continued)

Field	Description
Allowed Source	Allows you to specify the ports that each MAC address is allowed to access. The options for the Allowed Source field include a single unit/port number or a port list value that you have previously configured in the MAC Address Security Port Lists screen. Default - (Blank field) Range A single unit/port or a port list value (for example, 1/3, 1/6, 3/4, S1, S5, etc.).

1 Multicast address -- Note that the first octet of any Multicast address will always be an odd number.

VLAN Configuration Menu screen

The VLAN Configuration Menu screen (Figure 71) allows you to select the appropriate screen to configure up to 64 VLANs. VLAN 1 is port-based by default. You can configure the remaining 63 VLANs to be of any appropriate combination of types.

You can configure as many as 63 protocol-based VLANs, with up to 15 different protocols. The number of different protocols you can configure depends on the number of hexadecimal values (PID values) associated with the protocol type. Some protocol types use more than one PID value. Refer to "Predefined Protocol Identifier (PID) description" on page 160. A port may not be a member of more than one protocol-based VLAN with the same PID.

You can configure up to 48 MAC SA-based VLANs. Up to 48 MAC addresses can be used with the existing MAC SA-based VLANs. Due to hardware limitations, it is possible that some MAC address cannot be entered, depended on the values of MAC addresses previously entered.

When you create VLANs, you can assign various ports (and therefore the devices attached to these ports) to different broadcast domains. Creating VLANs increases network flexibility by allowing you to reassign devices to accommodate network moves, additions, and changes, eliminating the need to change physical cabling.

See "IGMP snooping" on page 89 for detailed information about configuring VLANs.

To open the VLAN Configuration Menu:

➡ Choose VLAN Configuration (or press v) from the Switch Configuration Menu screen.

Figure 71 VLAN Configuration Menu screen

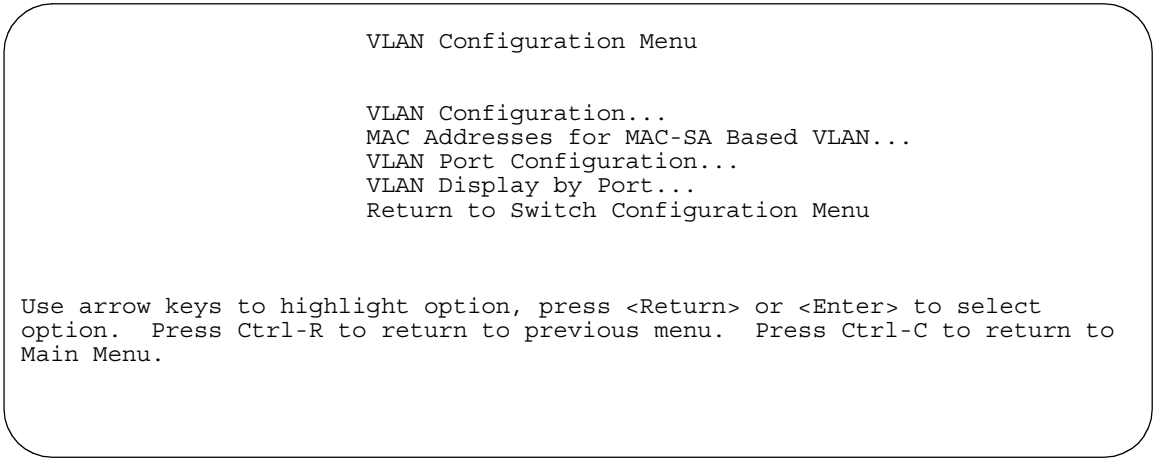

VLAN Configuration Menu
VLAN Configuration...
MAC Addresses for MAC-SA Based VLAN...
VLAN Port Configuration...
VLAN Display by Port...
Return to Switch Configuration Menu
Use arrow keys to highlight option, press <Return> or <Enter> to select option. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 21 describes the VLAN Configuration Menu screen options.

Table 21 VLAN Configuration Menu Screen options

Option	Description
VLAN Configuration...	Displays the VLAN Configuration screen (see "VLAN Configuration screen" on page 156). This screen allows you to set up VLAN workgroups.
MAC Addresses for MAC-SA Based VLAN	Displays the VLAN's MAC SA-based VLAN addresses. (see "MAC Address Configuration for MAC-SA-Based VLAN screen" on page 162)
VLAN Port Configuration...	Displays the VLAN Port Configuration screen (see "VLAN Port Configuration screen" on page 163). This screen allows you to set up a specific switch port.
VLAN Display by Port...	Displays the VLAN Display by Port screen (see "VLAN Display by Port screen" on page 166).
Return to Switch Configuration Menu	Exits the VLAN Configuration Menu screen and displays the Switch Configuration Menu screen.

VLAN Configuration screen

The VLAN Configuration screen (Figure 72) allows you to create and assign VLAN port memberships to standalone or stacked unit ports. You can create port-based and policy-based VLANs for the following purposes:

- IEEE 802.1Q port-based VLANs allow you to explicitly configure switch ports as VLAN port members.

  When you create a port-based VLAN, you assign a Port VLAN Identifier (PVID) and specify which ports belong to the VLAN.

- Policy-based VLANs allow you to configure your switch ports as members of a broadcast domain, based on the information within a packet. Policy-based VLANs can localize broadcast traffic and assure that only the policy-based VLAN ports are flooded with the specified packets.

When you configure ports as VLAN port members, they become part of a set of ports that form a broadcast domain for a specific VLAN. You can assign switch ports, whether standalone or stacked unit ports, as VLAN port members of one or more VLANs.

You can add or remove port members from a VLAN in accordance with the IEEE 802.1Q tagging rules. See "IEEE 802.1Q tagging" on page 72 for a description of important terms used with 802.1Q VLANs.

You can also use this screen to create and to delete specific VLANs, to assign VLAN names, and to assign any VLAN as the management VLAN.

To open the VLAN Configuration screen:

➨ Choose VLAN Configuration (or press v) from the VLAN Configuration Menu screen.

Figure 72 VLAN Configuration screen

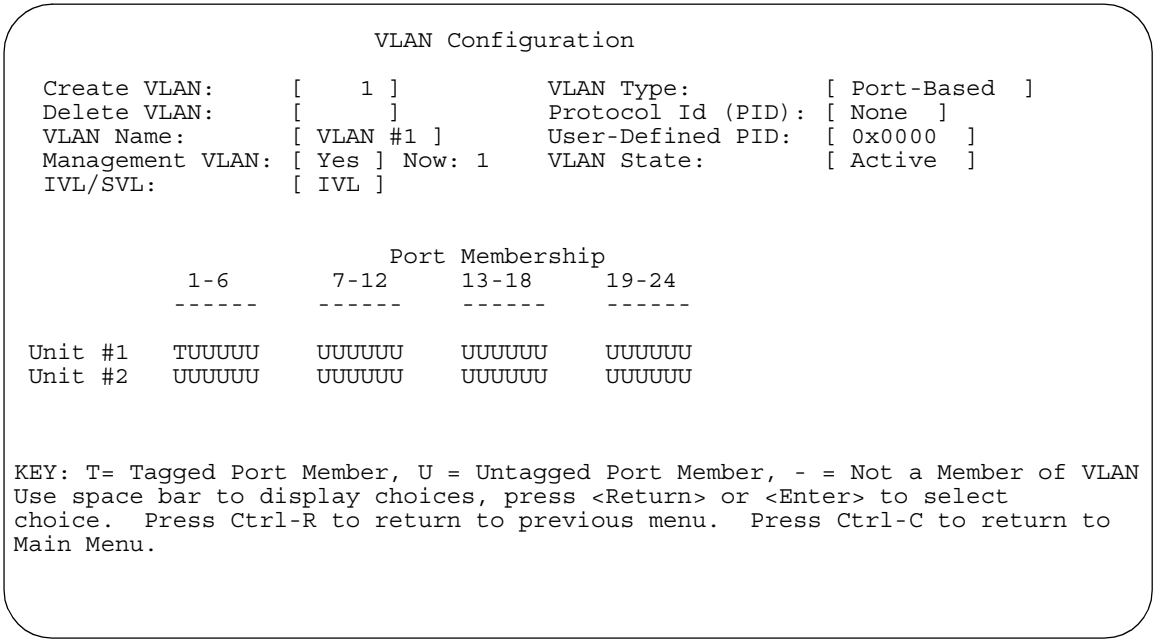

VLAN Configuration
Create VLAN: [1]
Delete VLAN: [ ]
VLAN Name: [VLAN #1]
Management VLAN: [Yes] Now: 1
IVL/SVL: [IVL]
VLAN Type: [Port-Based]
Protocol Id (PID): [None]
User-Defined PID: [0x0000]
VLAN State: [Active]
Port Membership
1-6
7-12
13-18
19-24
Unit #1 TUUUUU UUUUUU UUUUUU UUUUUU
Unit #2 UUUUUU UUUUUU UUUUUU UUUUUU
KEY: T= Tagged Port Member, U = Untagged Port Member, - = Not a Member of VLAN
Use space bar to display choices, press <Return> or <Enter> to select
choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to
Main Menu.

Table 22 describes the VLAN Configuration screen fields.

Table 22 VLAN Configuration screen fields

Field	Description
Create VLAN	Allows you to set up or view configured VLAN workgroups. Enter the number of the new VLAN you want to create or view, then press [Return]. The Port Membership fields indicate the corresponding VLAN workgroup configuration, if configured. Dashes (-) indicate no VLAN Members are configured. Alternatively, you can use the space bar to toggle through the various configured VLAN workgroups. You can create up to 64 different VLANs (except VLAN #1). Default 1 Range 2 to 4094
Delete VLAN	Allows you to delete specified VLANs, except the assigned management VLAN (See Management VLAN field). Enter the number of the VLAN you want to delete, then press [Return], or use the space bar to toggle through the selection until you reach the VLAN you want to delete, then press [Return].

Table 22 VLAN Configuration screen fields (continued)

Field	Description
	The specified VLAN is deleted as soon as you press [Return]. The software does not prompt you to reconsider this action. If you delete a VLAN, all configuration parameters that are associated with that VLAN are deleted also. You cannot delete VLAN 1. By default, all switch ports are assigned as untagged members of VLAN 1 with all ports configured as PVID = 1. See "IEEE 802.1Q VLAN workgroups" on page 71 for more information. Default blank field Range 2 to 4094
VLAN Name	Allows you to assign a name field to configured VLANs. Default VLAN # (*VLAN number*) Range Any ASCII string of up to 16 printable characters
Management VLAN	Allows you to assign any VLAN as the management VLAN. VLAN 1 is the default management VLAN for the switch. To set this field, the VLAN State field value must be Active. Default No Range Yes, No
IVL/SVL	Allows you to select either Shared VLAN Learning (SVL), multiple VLANs using a single forwarding database, or Independent VLAN Learning (IVL), each VLAN using a unique forwarding database. To set this field, the VLAN State field value must be Inactive. IVL is a Business Policy Switch-only feature. The IVL option is enabled only in Pure BPS 2000 Stack mode. The SVL option is enabled in the Hybrid Stack mode. See "Stack Operational Mode screen" on page 199. Default SVL (in a mixed stack) IVL (in a pure Business Policy Switch stack) Range IVL, SVL
VLAN Type	Allows you to select the type of VLAN (port-based, protocol-based, or MAC SA-based) to create. To set this field, the VLAN State field value must be Inactive. Default Port-based Range Port-based, Protocol-based, MAC-SA-based
Protocol ID (PID)	Allows you to set the protocol type of your VLAN (to set this field, the VLAN State field value must be Inactive). You can choose from any of 15 predefined supported protocols (see "Predefined Protocol Identifier (PID) description" on page 160), or you can create your own user-defined protocol-based VLAN (see the User-defined PID field description for more information.

Table 22 VLAN Configuration screen fields (continued)

Field	Description
	Default None Range None, IP Ether2, Ipx 802.3, Ipx 802.2, Ipx Snap, Ipx Ether2, AplTk Ether2Snap, Declat Ether2, DecOth Ether2, Sna 802.2, Sna Ether2, NetBios 802.2, Xns Ether2,Vines Ether2, Ipv6 Ether2, User-Defined, Rarp Ether2
User-Defined PID	Allows you to create your own user-defined VLAN where you specify the Protocol Identifier (PID) for the VLAN. To set this field, the VLAN State field must be set to Inactive. Some restrictions apply. "User-Defined Protocol Identifier Description" on page 161. Default 0x0000 Range Any 16-bit hexadecimal value (for example, 0xABCD)
VLAN State	Allows you to activate your newly created VLAN. The following field values: VLAN Type, Protocol Id (PID), or User-defined PID must be configured appropriately before this field can be set to active. After you set the VLAN State field value to Active, you cannot change the VLAN State, VLAN Type, Protocol Id, or User-defined PID field values, unless you delete the VLAN. If you delete a VLAN, all configuration parameters that are associated with that VLAN are also deleted. Default Inactive Range Inactive, Active
Port Membership	Allows you to assign VLAN port memberships to *standalone* or *stacked unit* ports. The ports can be configured in one or more VLANs. To set this field, you must set the VLAN State field to Active. Certain restrictions apply for Gigabit and BayStack 410 ports (see "Gigabit ports restriction" on page 163). This field is dependent on the Tagging field value in the VLAN Port Configuration screen (see the Tagging field description in "VLAN Port Configuration screen fields" on page 164). For example: • When the Tagging field is set to *Untagged Access*, you can set the Port Membership field as an untagged port member (U) or as a non-VLAN port member (-). • When the Tagging field is set to *Tagged Trunk*, you can set the Port Membership field as a tagged port member (T) or as a non-VLAN port member (-).
	The Port Membership fields are displayed in six-port groups (for example, 1-6, 7-12, 13-18). The number of ports displayed depends on the switch model or type of optional MDA installed in the Uplink Module slot. Default U (All ports are assigned as untagged members of VLAN 1.) Range U, T, and -

Predefined Protocol Identifier (PID) description

Table 23 defines the standard protocol-based VLANs and PID types that are supported by the Business Policy Switch and BayStack 450 and BayStack 410 switches.

Table 23 Predefined Protocol Identifier (PID)

PID Name	Encapsulation	PID Value (hex)	VLAN Type
IP Ether2	Ethernet type 2	0800, 0806	Standard IP on Ethernet Type 2 frames
Ipx 802.3	Ethernet 802.2	FF FF	Novell IPX on Ethernet 802.3 frames
Ipx 802.2	Ethernet 802.0	E0 E0	Novell IPX on Ethernet 802.2 frames
Ipx Snap	Ethernet Snap	8137, 8138	Novell IPX on Ethernet SNAP frames
Ipx Snap2	Ethernet type 2	8137, 8138	Novell IPX on Ethernet Type 2 frames
AplTk Ether2 Snap	Ethernet type 2 or Ethernet Snap	809B, 80F3	AppleTalk on Ethernet Type 2 and Ethernet Snap frames
Declat Ether2	Ethernet type 2	6004	DEC LAT protocol
DecOther Ether2	Ethernet type 2	6000 - 6003, 6005 - 6009, 8038	Other DEC protocols
Sna 802.2	Ethernet 802.2	04**, **04	IBM SNA on IEEE 802.2 frames
Sna Ether2	Ethernet type 2	80D5	IBM SNA on Ethernet Type 2 frames
NetBios 802.2	Ethernet type 2	F0**, **F0	NetBIOS protocol
Xns Ether2	Ethernet type 2	0600, 0807	Xerox XNS
Vines Ether2	Ethernet type 2	0BAD	Banyan VINES
Ipv6 Ether2	Ethernet type 2	86DD	IP version 6
User-Defined	Ethernet type 2, Ethernet 802.2, or Ethernet Snap	User-defined 16 bit value	User-defined protocol-based VLAN (see "Predefined Protocol Identifier (PID) description" below, for more information).
RARP Ether2	Ethernet type 2	8035	Reverse Address Resolution Protocol (RARP): RARP is a protocol used by some old diskless devices to obtain IP addresses by providing the MAC layer address. When you create a VLAN based on RARP, you can limit the RARP broadcasts to the ports that lead to the RARP server.

User-Defined Protocol Identifier Description

In addition to the standard predefined protocols, user-defined protocol-based VLANs are supported. For user-defined protocol-based VLANs, you specify the protocol identifier (PID) for the VLAN. Any frames that match the specified PID in any of the following ways are assigned to that user-defined VLAN:

- The ethertype for Ethernet type 2 frames
- The PID in Ethernet SNAP frames
- The DSAP or SSAP value in Ethernet 802.2 frames

The following PIDs (Table 24) are reserved and are not available for user-defined PIDs.

Table 24 Reserved PIDs

PID Value (hex)	Comments
04**, **04	Sna 802.2
F0**, **F0	NetBIOS 802.2
AAAA	SNAP
0 - 05DC	Overlaps with 802.3 frame length
0600, 0807	Xns Ether2
0BAD	Vines Ether2
4242	IEEE 802.1D BPDUs
6000 - 6009, 8038	Dec
0800, 0806	Ip Ether2 (including ARP)
8035	RARP Ether2
809B, 80F3	AplTk Ether2Snap
8100	IEEE 802.1Q for tagged frames
8137, 8138	Ipx
80D5	SNA Ether2
86DD	Ipv6 Ether2
8808	Ipx 802.3
Ipx 802.3	Ethernet 802.2
Ipx 802.2	Ethernet 802.

MAC Address Configuration for MAC-SA-Based VLAN screen

The MAC Address Configuration for MAC-SA Based VLAN screen (Figure 73) allows you to configure specific MAC SA-based VLANs. This screen allows you to select a MAC SA-based VLAN.

Figure 73 MAC Address Configuration for MAC-SA Based VLAN screen

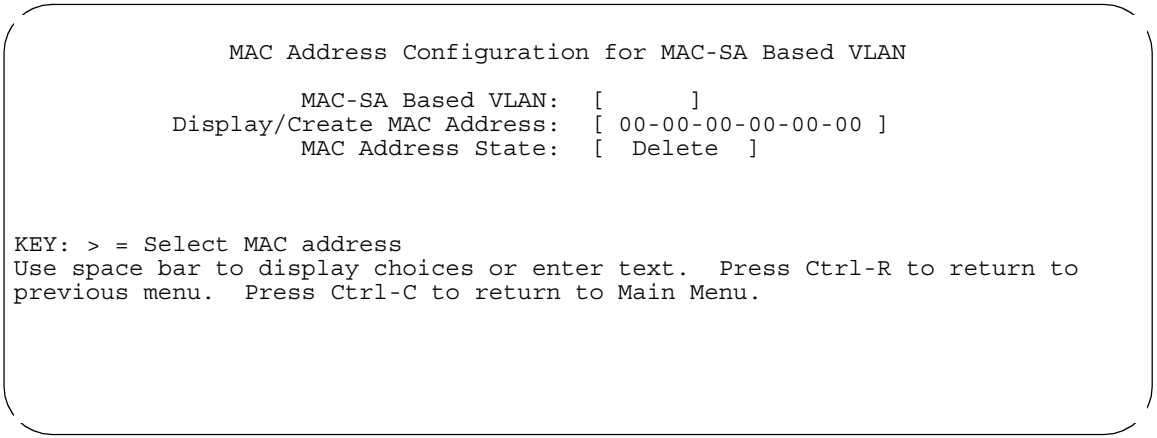

MAC Address Configuration for MAC-SA Based VLAN
MAC-SA Based VLAN: [ ]
Display/Create MAC Address: [00-00-00-00-00-00]
MAC Address State: [Delete]
KEY: > = Select MAC address
Use space bar to display choices or enter text. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 25 describes the MAC Address Configuration for MAC-SA Based VLAN screen fields.

Table 25 MAC Address Configuration for MAC-SA Based VLAN screen fields

Field	Description
MAC-SA Based VLAN	Allows you to select a MAC SA-based VLAN. Default: The least valued active MAC-SA based VLAN will be displayed. Range: 2 to 4094 (must be a currently active MAC-SA based VLAN)
Display/Create MAC Address	Allows you to enter a MAC address. If the address is already present in the selected MAC-SA based VLAN, its state is displayed. Otherwise, that address will be activated in the MAC-SA based VLAN.
MAC Address State	Displays current state (Active) or allows you to delete a MAC address (Delete).

Gigabit ports restriction

Gigabit ports and BayStack 410 ports do not have the ability to assign incoming untagged frames to a protocol-based VLAN.

To allow Gigabit ports to participate in protocol-based VLANs, you must set the Tagging field value in the VLAN Port Configuration screen to Tagged Trunk. Incoming untagged frames will be assigned to the PVID VLAN.

VLAN Port Configuration screen

The VLAN Port Configuration screen (Figure 74) allows you to configure specified switch ports with the appropriate PVID/VLAN association that enables the creation of VLAN broadcast domains (see "Shared servers" on page 81 for more information about setting up VLAN broadcast domains).

You can configure specified switch ports to filter (discard) all received tagged frames, untagged frames, or unregistered frames (see "IEEE 802.1Q tagging" on page 72).

You can also prioritize the order in which the switch forwards packets, on a per-port basis (see "IEEE 802.1p prioritizing" on page 94).

To open the VLAN Port Configuration screen.

Choose VLAN Port Configuration (or press c) from the VLAN Configuration Menu screen.

Figure 74 VLAN Port Configuration screen

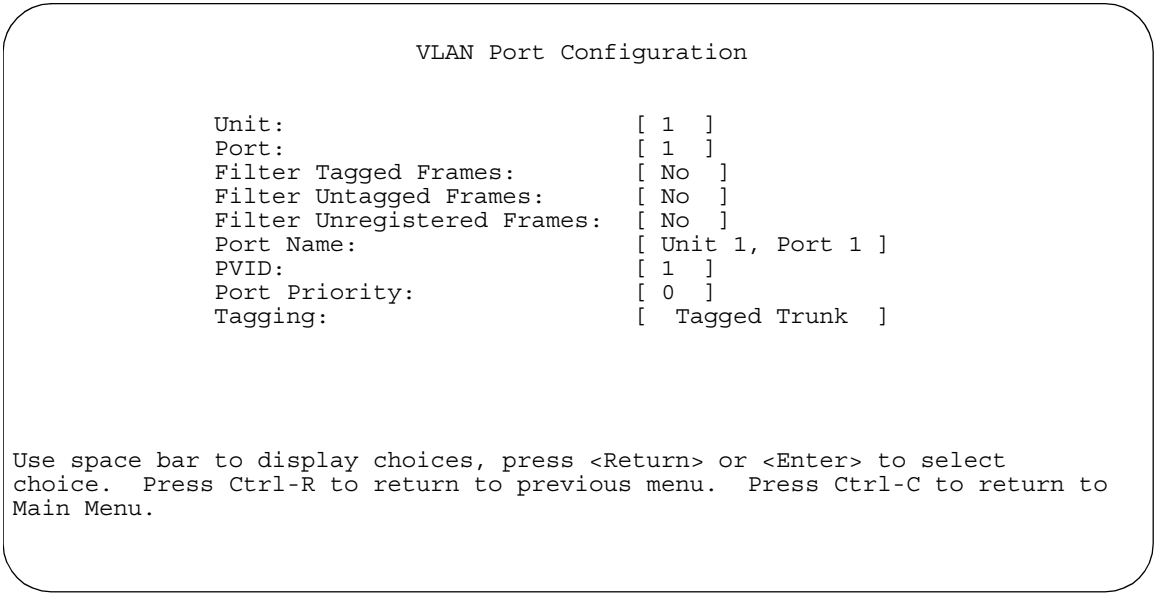

VLAN Port Configuration
Unit: [1]
Port: [1]
Filter Tagged Frames: [No]
Filter Untagged Frames: [No]
Filter Unregistered Frames: [No]
Port Name: [Unit 1, Port 1]
PVID: [1]
Port Priority: [0]
Tagging: [Tagged Trunk]
Use space bar to display choices, press <Return> or <Enter> to select choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 26 describes the VLAN Port Configuration screen fields.

Table 26 VLAN Port Configuration screen fields

Field	Description
Unit	Allows you to select a switch in your stack. To view another switch, type its switch number and press [Enter], or press the spacebar to toggle the switch numbers.
Port	Allows you to select the number of the port you want to view or configure. To view another port, type its port number and press [Enter], or press the spacebar to toggle the port numbers.
Filter Tagged Frames	Allows you to set this port to filter (discard) all received tagged packets. Default No Range No, Yes
Filter Untagged Frames	Sets this port to filter (discard) all received untagged frames. Default No Range No, Yes

Table 26 VLAN Port Configuration screen fields (continued)

Field	Description
Filter Unregistered Frames	Sets this port to filter (discard) all received unregistered packets. The Business Policy Switch does not support the Yes option. Default No Range No, Yes
Port Name	The default port name (with associated stack unit number when configured) assigned to this port. You can change this field to any name that is up to 16 characters long. Default Unit *x*, Port *x* Range Any ASCII string of up to 16 printable characters
PVID	Associates this port with a specific VLAN. For example, a port with a PVID of 3 assigns all untagged frames received on this port to VLAN 3. Default 1 Range 1 to 4094
Port Priority	Prioritizes the order in which the switch forwards packets received on specified ports (see "IEEE 802.1p prioritizing" on page 94). Default 0 Range 0 to 7
Tagging	Allows you to assign VLAN Port Membership tagging options to this port, as follows: • Untagged Access: Any VLAN that this port is a member of *will not* be 802.1Q tagged. • Tagged Trunk: Any VLAN that this port is a member of will be 802.1Q tagged. **Restriction:** If this port is a Gigabit port or a BayStack 410-24T switch port that is a protocol-based VLAN member, you cannot set this field value to Untagged Access. This restriction also applies if this port is a MultiLink trunk member with a Gigabit port or a BayStack 410-24T switch port that is a protocol-based VLAN member. Setting this field value on any port to Tagged Trunk causes incoming untagged packets to be assigned to the PVID VLAN. They will no longer be classified based on the information within the packet, even if they are members of a policy-based VLAN. Default Untagged Access Range Untagged Access, Tagged Trunk

VLAN Display by Port screen

The VLAN Display by Port screen (Figure 75) allows you to view VLAN characteristics associated with a specified switch port.

Choose VLAN Display by Port (or press d) from the VLAN Configuration Menu screen to open the VLAN Display by Port screen.

Figure 75 VLAN Display by Port screen

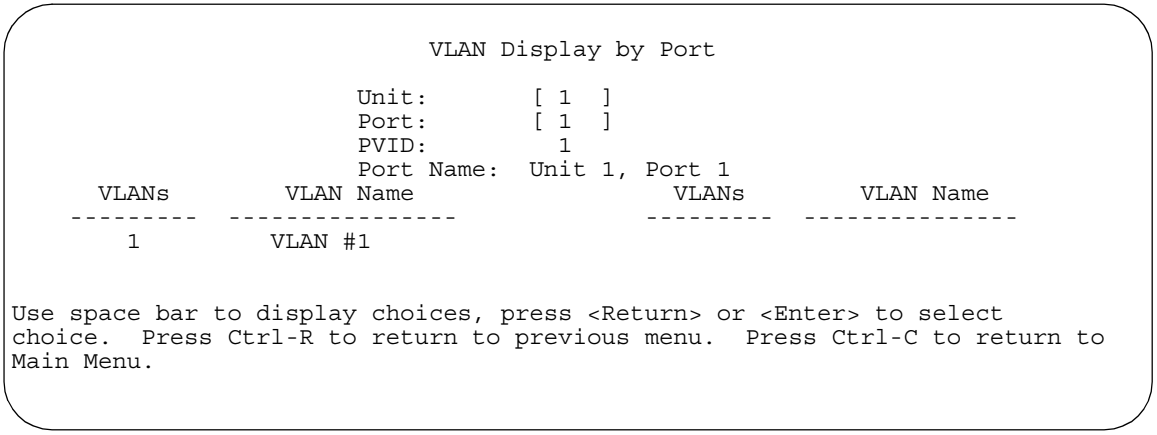

VLAN Display by Port
Unit: [1]
Port: [1]
PVID: 1
Port Name: Unit 1, Port 1
VLANs
VLAN Name
VLANs
VLAN Name
1
VLAN #1
Use space bar to display choices, press <Return> or <Enter> to select choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 27 describes the VLAN Display by Port screen fields.

Table 27 VLAN Display by Port screen fields

Field	Description
Unit	Allows you to select a switch in your stack. To view another switch, type its switch number and press [Enter], or press the spacebar to toggle the switch numbers.
Port	Allows you to select the number of the port you want to view. To view another port, type its port number and press [Enter], or press the spacebar on your keyboard to toggle the port numbers.
PVID	Read-only field that indicates the PVID setting for the specified port.
Port Name	Read-only field that indicates the port name assigned to the specified port.
VLANs	Column header for the read-only fields listing the VLANs associated with the specified port.
VLAN Name	Column header for the read-only fields listing the VLAN Names associated with the specified port.

Port Configuration screen

The Port Configuration screen (Figures 76 and 77) allows you to configure specific switch ports or all switch ports. You can enable or disable the port status of specified switch ports, set the switch ports to autonegotiate for the highest available speed of the connected station, or set the speed for selected switch ports (autonegotiation is not supported on fiber optic ports).

You can disable switch ports that are trunk members; however, the screen prompts for verification of the request before completing the action. Choosing [Yes] disables the port and removes it from the trunk.

Note: The Autonegotiation fields, the Speed fields, and the Duplex fields are independent of MultiLink Trunking, rate limiting, VLANs, IGMP Snooping, and the STP.

To open the Port Configuration screen:

- Choose Port Configuration (or press p) from the Switch Configuration Menu screen.

Figure 76 Port Configuration screen (1 of 2)

```
                              Port Configuration
                                 Unit:  [ 1 ]
Port  Trunk  Status  Link  LnkTrap  Autonegotiation   Speed  Duplex
----  -----  ------  ----  -------  ---------------   --------------
   1  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   2  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   3  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   4  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   5  [ Enabled  ]   Up   [ On  ]    [ Enabled  ]     [100Mbs / Half]
   6  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   7  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   8  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
   9  [ Enabled  ]   Up   [ On  ]    [ Enabled  ]     [100Mbs / Full]
  10  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  11  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  12  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  13  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  14  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]

                                                              More...

Press Ctrl-N to display choices for additional ports.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 77 Port Configuration screen (2 of 2)

```
                              Port Configuration
                                 Unit:  [ 1 ]
Port  Trunk  Status  Link  LnkTrap  Autonegotiation   Speed  Duplex
----  -----  ------  ----  -------  ---------------   --------------
   1  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  15  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  16  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  17  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  18  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  19  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  20  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  21  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  22  [ Enabled  ]   Up   [ On  ]    [ Enabled  ]     [100Mbs / Full]
  23  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
  24  [ Enabled  ]  Down  [ On  ]    [ Enabled  ]     [              ]
Switch [ Enable   ]       [ On  ]    [ Enable   ]     [10Mbs / Half ]
Stack  [ Enable   ]       [ On  ]    [ Enable   ]     [10Mbs / Half ]


Press Ctrl-P to display choices for ports 1-14.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Note: When a Gigabit MDA is installed, only the Status field for that MDA port is configurable. See "High Speed Flow Control Configuration screen" on page 170 to set the autonegotiation field for the Gigabit MDA port. Gigabit MDAs only support 1000 Mb/s in full-duplex mode.

Table 28 describes the Port Configuration screen fields.

Table 28 Port Configuration screen fields

Field	Description
Port	Indicates the switch port numbers that correspond to the field values in that row of the screen (for example, the field values in row 2 apply to switch port 2). The values that you set in the *Switch* row will affect all switch ports and, when the switch is part of a stack, the values that you set in the *Stack* row will affect all ports in the entire stack (except the Gigabit MDA ports or fiber optic ports, when installed).
Trunk	The read-only data displayed in this column indicates the trunks that correspond to the switch ports specified in the Trunk Members fields of the Trunk Configuration screen (see "MultiLink Trunk Configuration Menu screen" on page 173).
Status	Allows you to disable any of the switch ports. You can also use this field to control access to any switch port. Default Value Enabled Range Enabled, Disabled
Link	A read-only field that indicates the current link state of the corresponding port, as follows: • Up: The port is connected and operational. • Down: The port is not connected or is not operational.
LnkTrap	Allows you to control whether link up/link down traps are sent to the configured trap sink from the switch. Default Value On Range On, Off
Autonegotiation	When enabled, sets the corresponding port speed to match the best service provided by the connected station, up to 100 Mb/s in full-duplex mode. This field is disabled for all fiber optic ports. Default Value Enabled Range Enabled, Disabled

Table 28 Port Configuration screen fields (continued)

Field	Description
Speed/Duplex[1]	Allows you to manually configure any port to support an Ethernet speed of 10 Mb/s or 100 Mb/s, in half- or full-duplex mode. This field is set (by default) to 1000 Mb/s, full-duplex for Gigabit ports only. Default Value 100Mbs/Half (when Autonegotiation is Disabled) Range 10Mbs/Half, 10Mbs/Full, 100Mbs/Half, 100Mbs/Full

1 Fiber optic ports can only be set to 100 Mb/s/Half or 100 Mb/s Full.

High Speed Flow Control Configuration screen

The High Speed Flow Control Configuration screen (Figure 78) allows you to set the port parameters for installed Gigabit MDAs.

Note: This screen only appears when an optional Gigabit MDA is installed in the Uplink Module slot.

Choose High Speed Flow Control Configuration (or press h) from the Switch Configuration Menu screen to open the High Speed Flow Control Configuration screen.

Figure 78 High Speed Flow Control Configuration

```
                    High Speed Flow Control Configuration


                       Unit:              [ 1 ]

                       Autonegotiation:   [ Enabled  ]
                       Flow Control:        Disabled
                       Preferred Phy:     [ Right ]

                       Active Phy:        Right




Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 29 describes the High Speed Flow Control Configuration screen fields.

Table 29 High Speed Flow Control Configuration Screen Fields

Field	Description
Unit	Allows you to select the unit number (when stacking is configured) to view or configure. To view or configure another unit, type its unit number and press [Enter], or press the spacebar to toggle the unit numbers (the system only displays a screen for units that are configured with a Gigabit MDA).
Autonegotiation	When enabled, the port only advertises support for 1000 Mb/s operation, in full-duplex mode. Default Value Enabled Range Enabled, Disabled
Flow Control	Allows you to control traffic and avoid congestion on the Gigabit MDA port. Two modes are available (see "Choosing a high speed flow control mode" for details about the two modes). The Flow Control field cannot be configured unless you set the Autonegotiation field value to Disabled. Default Value Disabled Range Disabled, Symmetric, Asymmetric

Table 29 High Speed Flow Control Configuration Screen Fields (continued)

Field	Description
	Note: The following two fields only appear when a single MAC MDA (450-1LR-MDA or 450-1SR MDA) with a separate redundant Phy port is installed.
Preferred Phy	Allows you to choose a preferred Phy port; the other Phy port reverts to backup. Default Value Right Range Right, Left
Active Phy	Indicates the operational Phy port. Default Value: None Range: None, Right, Left

Choosing a high speed flow control mode

The high speed flow control feature allows you to control traffic and avoid congestion on the Gigabit full-duplex link. If the receive port buffer becomes full, the Business Policy Switch issues a flow-control signal to the device at the other end of the link to suspend transmission. When the receive buffer is no longer full, the switch issues a signal to resume the transmission. You can choose Symmetric or Asymmetric flow control mode.

Symmetric mode

This mode allows both the Gigabit MDA port and its link partner to send flow control *pause* frames to each other.

When a pause frame is received (by either the Gigabit MDA port or its link partner), the port suspends transmission of frames for a number of slot times specified in the control frame or until a pause-release control frame is received. Both devices on the link must support this mode when it is selected.

Asymmetric mode

This mode allows the link partner to send flow control pause frames to the Gigabit MDA port. When a pause frame is received, the receiving port suspends transmission of frames for a number of slot times specified in the control frame or until a pause-release control frame is received.

In this mode, the Gigabit MDA port is disabled from transmitting pause frames to its link partner. Use this mode when the Gigabit MDA port is connected to a buffered repeater device.

MultiLink Trunk Configuration Menu screen

The MultiLink Trunk Configuration Menu screen (Figure 79) allows you to select the appropriate screen to configure up to six MultiLink Trunks (you can group up to four switch ports together to form each trunk).

You can configure up to six MultiLink Trunks in each stack, with trunk members in either a single unit or distributed between units within the stack configuration (distributed trunking).

You can monitor the bandwidth usage for the trunk member ports within each trunk. For more information about configuring MultiLink Trunks, see "MultiLink Trunks" on page 97.

Note: When a trunk is not active (Trunk Status field set to Disabled), configuration changes do not take effect until you set the Trunk Status field to Enabled.

To open the MultiLink Trunk Configuration Menu screen:

- Choose MultiLink Trunk Configuration (or press t) from the Switch Configuration Menu screen.

Figure 79 MultiLink Trunk Configuration Menu screen

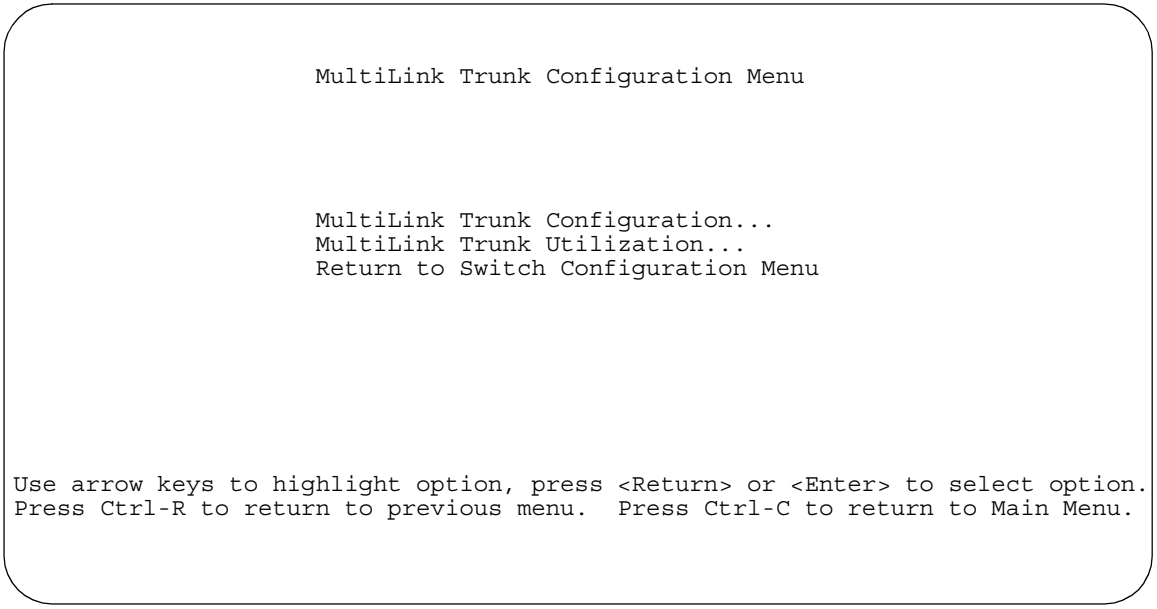

MultiLink Trunk Configuration Menu
MultiLink Trunk Configuration...
MultiLink Trunk Utilization...
Return to Switch Configuration Menu
Use arrow keys to highlight option, press <Return> or <Enter> to select option.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 30 describes the MultiLink Trunk Configuration Menu screen options.

Table 30 MultiLink Trunk Configuration Menu screen options

Option	Description
MultiLink Trunk Configuration...	Displays the MultiLink Trunk Configuration screen (Figure 80). This screen allows you to configure up to six MultiLink Trunks within a standalone switch or within a stack configuration. You can group up to four switch ports together to form each trunk.
MultiLink Trunk Utilization...	Displays the MultiLink Trunk Utilization screen (Figure 81 and Figure 82). This screen allows you to monitor the bandwidth utilization of the configured trunks.
Return to Switch Configuration Menu	Exits the MultiLink Trunk Configuration Menu screen and displays the Switch Configuration Menu screen.

MultiLink Trunk Configuration screen

The MultiLink Trunk Configuration screen (Figure 80) allows you to configure up to six trunks in a standalone switch or stack. In a stack configuration, trunk members can be distributed between any of the units within the same stack configuration.

Any mix of up to eight Business Policy Switches *and* BayStack 450 and BayStack 410 switches can be stacked to provide a total of 224 ports (when all MDA slots are configured with the maximum port availability). See Appendix B, "Interoperability in a mixed stack configuration," for more information about a mixed stack configuration.

Figure 80 shows six trunks in a stack configuration:

- Trunk 1 has four trunk members in unit 3.
- Trunks 2, 3, 4, and 5 each have two trunk members in individual units.
- Trunk 6 has four trunk members *distributed into four separate units* of the stack.

When the trunks are enabled, the trunk members take on default settings necessary for correct operation of the MultiLink Trunking feature. These default settings can affect the correct operation of your configured network. If you disable a trunk, you may need to reconfigure the specific trunk members switch ports to return to the previous switch configuration. See "MultiLink Trunking" on page 45 for more information.

To open the MultiLink Trunk Configuration screen:

➡ Choose Trunk Configuration (or press t) from the MultiLink Trunk Configuration Menu screen.

Figure 80 MultiLink Trunk Configuration screen

```
                          MultiLink Trunk Configuration

Trunk   Trunk Members (Unit/Port)   STP Learning   Trunk Mode   Trunk Status
----- ------------------------------ ------------ ---------------------------
  1   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]
  2   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]
  3   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]
  4   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]
  5   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]
  6   [  /   ][  /  ][  /  ][  /  ] [ Normal   ]      Basic      [Disabled ]

Trunk     Trunk Name
----- ------------------
  1   [ Trunk #1 ]
  2   [ Trunk #2 ]
  3   [ Trunk #3 ]
  4   [ Trunk #4 ]
  5   [ Trunk #5 ]
  6   [ Trunk #6 ]



Use space bar to display choices, press <Return> or <Enter> to select
choice.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

Table 31 describes the MultiLink Trunk Configuration screen fields.

Table 31 MultiLink Trunk Configuration screen fields

Field	Description
Trunk	Column header for the read-only fields in this screen. The read-only data displayed in the Trunk column indicates the trunk (1 to 6) that corresponds to the switch ports specified in the user-configurable Trunk Members fields.
Trunk Members (Unit/Port)	The Trunk Members column contains fields in each row that can be configured to create the corresponding trunk. The Unit value in the (Unit/Port) field is configurable only when the switch (unit) is part of a stack configuration. It indicates that the trunk members in this row are associated with the specified unit number configured in the Unit field. Each switch port can only be a member of a single trunk. The appropriate trunk number for each trunk member configured within this field is shown adjacent to the corresponding switch port in the following screens: Port Configuration screen, and Spanning Tree Configuration screen. Default Value blank field Range 1 to 8 or 1 to 28 (depending on model type)
STP Learning	The STP Learning column contains a single field for each row that, when enabled, allows the specified trunk to participate in the spanning tree. This setting overrides those of the individual trunk members. Fast is the same as Normal, except that the state transition timer is shortened to two seconds. Default Value Normal Range Normal, Fast, Disabled
Trunk Mode	The Trunk Mode column contains a single read only field for each row that indicates the default operating mode for the switch. **Basic:** Basic mode is the default mode for the switch. When in this mode, source MAC addresses are dynamically assigned to specific trunk members for flooding and forwarding, which allows the switch to stabilize and distribute the data streams of source addresses across the trunk members.
Trunk Status	The Trunk Status column contains a single field for each row that allows users to enable or disable any of the trunks. Default Value Disabled Range Enabled, Disabled
Trunk Name	The Trunk Name column contains a single optional field in each row that can be used to assign names to the corresponding configured trunks. The names chosen for this example can provide meaningful information to the user (for example, S1:T1 to FS2 indicates Trunk 1, in switch S1 connects to File Server 2).

MultiLink Trunk Utilization screen

The MultiLink Trunk Utilization screen (Figure 81 and Figure 82) allows you to monitor the percentage of bandwidth used by configured trunk members. You can choose the type of traffic to monitor.

Figure 81 shows an *example* of bandwidth utilization rates for the trunk member ports configured in Figure 80. Because two screens are necessary to show all of the configured trunks (up to six), the screen prompts you to Press [Ctrl]-N to view trunks five and six.

Choose MultiLink Trunk Utilization (or press u) from the MultiLink Trunk Configuration Menu screen to open the MultiLink Trunk Utilization screen.

Figure 81 MultiLink Trunk Utilization screen (1 of 2)

```
                          MultiLink Trunk Utilization

Trunk   Traffic Type    Unit/Port   Last 5 Minutes  Last 30 Minutes   Last
Hour
-----   -------------   ---------   --------------  ---------------   --------
  1     [ Rx and Tx ]      3/6         90.0%             70.0%          90.0%
                           3/7         20.0%             55.0%          80.0%
                           3/9         35.0%             45.0%          45.0%
                           3/17        85.0%             35.0%          20.0%
  2     [ Rx and Tx ]      4/25        45.0%             45.0%          50.0%
                           4/26        25.0%             70.0%          35.0%


  3     [ Rx and Tx ]      6/13        35.0%             35.0%          50.0%
                           6/14        30.0%             80.0%          70.0%


  4     [ Rx and Tx ]      5/19        40.0%             35.0%          75.0%
                           5/20        25.0%             70.0%          85 0%



                                                                        More...
Press Ctrl-N to display utilization for trunks 5-6.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 82 MultiLink Trunk Utilization screen (2 of 2)

```
                          MultiLink Trunk Utilization

Trunk   Traffic Type    Unit/Port   Last 5 Minutes  Last 30 Minutes   Last
Hour
-----   -------------   ---------   --------------  ---------------   -------
  5     [ Rx and Tx ]      8/22        45.0%             35.0%          50.0%
                           8/23        55.0%             25.0%          70.0%


  6     [ Rx and Tx ]      3/2         65.0%             30.0%          55.0%
        [ Rx and Tx ]      1/2         45.0%             50.0%          35.0%
        [ Rx and Tx ]      7/2         25.0%             40.0%          50.0%
        [ Rx and Tx ]      5/6         75.0%             80.0%          55.0%



Press Ctrl-P to display utilization for trunks 1-4.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 32 describes the MultiLink Trunk Utilization screen fields.

Table 32 MultiLink Trunk Utilization screen fields

Field	Description
Trunk	Column header for the read-only fields in this screen. The read-only data displayed in this column indicates the trunk (1 to 6) that corresponds to the switch ports specified in the Port field.
Traffic Type	Allows you to choose the traffic type to be monitored for percent of bandwidth utilization (see Range). Default Value Rx and Tx Range Rx and Tx, Rx, Tx
Unit/Port	Lists the trunk member ports that correspond to the trunk specified in the Trunk column. The (Unit/) extension to the Port column name only appears when the switch (unit) is part of a stack configuration. It indicates that the ports in this row are associated with the specified unit number configured in the Unit field.
Last 5 Minutes	This read-only field indicates the percentage of packets (of the type specified in the Traffic Type field) utilized by the port in the last 5 minutes. This field provides a running average of network activity and is updated every 15 seconds.

Table 32 MultiLink Trunk Utilization screen fields (continued)

Field	Description
Last 30 Minutes	This read-only field indicates the percentage of packets (of the type specified in the Traffic Type field) utilized by the port in the last 30 minutes. This field provides a running average of network activity and is updated every 15 seconds.
Last Hour	This read-only field indicates the percentage of packets (of the type specified in the Traffic Type field) utilized by the port in the last 60 minutes. This field provides a running average of network activity and is updated every 15 seconds.

Port Mirroring Configuration screen

The Port Mirroring Configuration screen allows you to configure a specific switch port to monitor up to two specified ports or two MAC addresses. You can specify port-based monitoring or address-based monitoring. In a stack configuration, you can monitor ports that reside on different units within the stack.

For more information about the port mirroring feature, see "Port mirroring (conversation steering)" on page 46.

Figure 83 shows an example of a Port Mirroring Configuration screen, in a stack configuration, where port 12 (in stack unit 3) is designated as the monitoring port for ports 5 and 6 of stack unit 4. When installed as a standalone switch, the screen does not display the (Unit/) field designation.

To open the Port Mirroring Configuration screen:

➨ Choose Port Mirroring Configuration (or press i) from the Switch Configuration Menu screen.

Figure 83 Port Mirror Configuration screen

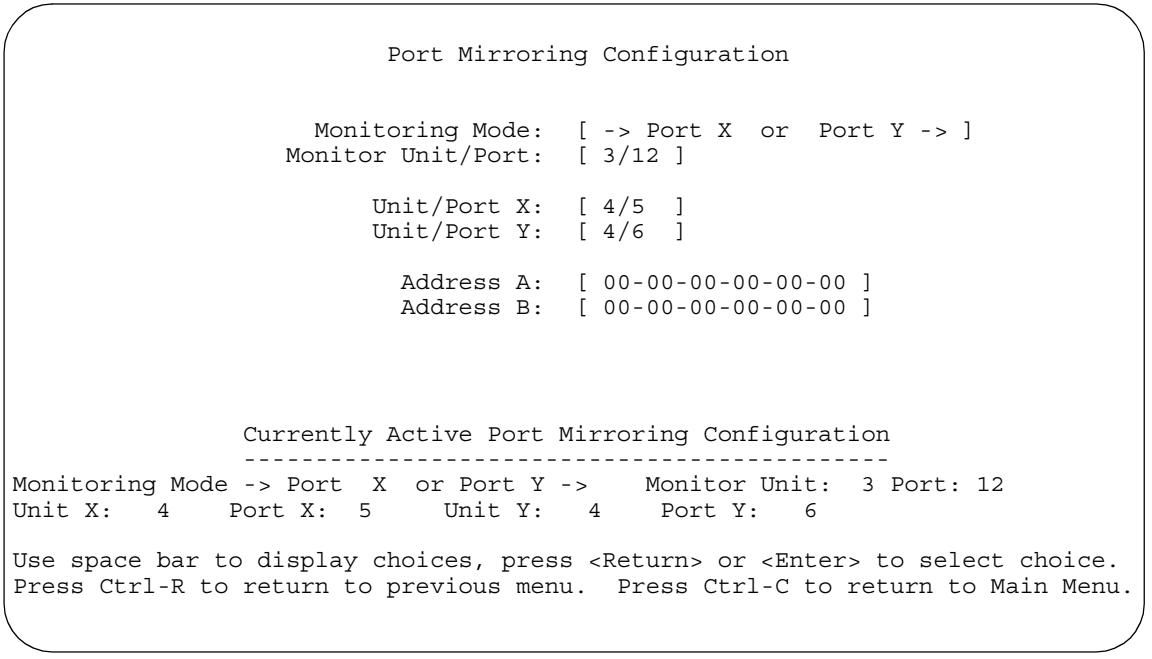

Port Mirroring Configuration
Monitoring Mode: [-> Port X or Port Y ->]
Monitor Unit/Port: [3/12]
Unit/Port X: [4/5]
Unit/Port Y: [4/6]
Address A: [00-00-00-00-00-00]
Address B: [00-00-00-00-00-00]
Currently Active Port Mirroring Configuration
Monitoring Mode -> Port X or Port Y -> Monitor Unit: 3 Port: 12
Unit X: 4 Port X: 5 Unit Y: 4 Port Y: 6
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 33 describes the Port Mirroring Configuration screen fields.

Table 33 Port Mirroring Configuration screen fields

Field	Description
Monitoring Mode	Allows a user to select any one of six port-based monitoring modes or any one of five address-based monitoring modes (see Table 34). Selecting any one of the six *port-based modes* activates the port X and port Y screen fields, where a user can choose up to two ports to monitor. Selecting any one of the five *address-based modes* activates the Address A and Address B screen fields, where a user can specify MAC addresses to monitor. Default Value Disabled Range See Table 34
Monitor Unit/Port	Indicates the port number (of the specified unit) that is designated as the monitor port. Default Value Zero-length string Range 1 to 8/ 1 to 28 (depending on model type)

Table 33 Port Mirroring Configuration screen fields (continued)

Field	Description
Unit/Port X	Indicates one of the ports (of the specified unit) that will be monitored by the designated port monitor when one of the port-based monitoring modes is selected. This port will be monitored according to the value of Port X in the Monitoring Mode field (see Table 34). Default Value Zero-length string Range 1 to 8/ 1 to 28 (depending on model type)
Unit/Port Y	Indicates one of the ports (of the specified unit) that will be monitored by the designated port monitor when one of the port-based monitoring modes is selected. When installed as a standalone switch, the screen does not display the (Unit/) field designation. This port will be monitored according to the value of Port Y in the Monitoring Mode field (see Table 34). Default Value Zero-length string Range 1 to 8/ 1 to 28 (depending on model type)
Address A	Indicates the MAC addresses that will be monitored by the designated port monitor when one of the address-based monitoring modes is selected. This port will be monitored according to the value of Address A in the selected Monitoring Mode field (see Table 34). Users can enter the MAC address from this screen or from the MAC Address Table screen. The entry is displayed and can be modified by either screen (see "MAC Address Table screen" on page 138). Default Value 00-00-00-00-00-00 (no MAC address assigned) Range 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF
Address B	Indicates the MAC addresses that will be monitored by the designated port monitor when one of the address-based monitoring modes is selected. This port will be monitored according to the value of Address B in the selected Monitoring Mode field (see Table 34). Users can enter the MAC address from this screen or from the MAC Address Table screen. The entry is displayed and can be modified by either screen (see "MAC Address Table screen" on page 138). Default Value 00-00-00-00-00-00 (no MAC address assigned) Range 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF

Table 34 describes the various monitoring modes available from the Port Mirroring Configuration screen.

Table 34 Monitoring modes

Field	Description
Port-based:	
Disabled	Default value for this feature.
-> Port X	Monitor all traffic received by Port X.
Port X ->	Monitor all traffic transmitted by Port X.
<-> Port X	Monitor all traffic received and transmitted by Port X.
-> Port X or Port Y ->	Monitor all traffic received by Port X or transmitted by Port Y.
-> Port X and Port Y ->	Monitor all traffic received by Port X (destined to Port Y) and then transmitted by Port Y.
<-> Port X and Port Y <->	Monitor all traffic received/transmitted by Port X and received/ transmitted by Port Y.
Address-based:	
Disabled	Default value for this feature.
Address A -> any Address	Monitor all traffic transmitted from Address A to any address.
any Address -> Address A	Monitor all traffic received by Address A from any address.
<-> Address A	Monitor all traffic received by or transmitted by Address A.
Address A -> Address B	Monitor all traffic transmitted by Address A to Address B.
Address A <-> Address B	Monitor all traffic between Address A and Address B (conversation between the two stations).

Rate Limiting Configuration screen

The Rate Limiting Configuration screen allows you to limit the forwarding rate of broadcast and multicast packets.

Figures 84 and 85 show sample rate limiting values for the two Rate Limiting Configuration screens.

Note: If a port is configured for rate-limiting, and it is a MultiLink Trunk member, all trunk member ports implement rate-limiting. Also, if a trunk member is implementing rate-limiting and the port is disabled from rate limiting, all trunk members are disabled from rate limiting.

To open the Rate Limiting Configuration screen:

➨ Choose Rate Limiting Configuration (or press l) from the Switch Configuration Menu screen.

Figure 84 Rate Limiting Configuration screen (1 of 2)

```
                        Rate Limiting Configuration
                                Unit:  [ 1 ]
 Port     Packet Type      Limit     Last 5 Minutes   Last Hour   Last 24 Hours
 ----   --------------   --------   --------------   ---------   -------------
   1    [ Both       ]   [ None ]        56.0%          22.0%         23.0%
   2    [ Multicast  ]   [  9%  ]        30.0%          27.0%         55.0%
   3    [ Both       ]   [ None ]        25.0%          24.0%         67.0%
   4    [ Both       ]   [ 10%  ]        72.0%          33.0%         55.0%
   5    [ Broadcast  ]   [ 10%  ]        35.0%          54.0%         78.0%
   6    [ Multicast  ]   [ 10%  ]        96.0%          45.0%         87.0%
   7    [ Both       ]   [ 10%  ]        86.0%          67.0%         60.0%
   8    [ Both       ]   [  5%  ]        58.0%          44.0%         70.0%
   9    [ Multicast  ]   [ None ]        11.0%          87.0%         65.0%
  10    [ Both       ]   [ None ]        27.0%          89.0%         44.0%
  11    [ Both       ]   [ None ]        15.0%          66.0%         66.0%
  12    [ Both       ]   [ None ]        12.0%          98.0%         99.0%
  13    [ Both       ]   [ None ]        44.0%          33.0%         89.0%
  14    [ Both       ]   [ None ]        34.0%          45.0%         76.0%
                                                                     More...

Press Ctrl-N to display choices for additional ports..
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 85 Rate Limiting Configuration screen (2 of 2)

```
                          Rate Limiting Configuration
                                Unit:  [ 1 ]
 Port    Packet Type     Limit     Last 5 Minutes   Last Hour   Last 24 Hours
 ----   -------------   --------   --------------   ---------   -------------
  15    [ Both       ]  [ None ]         44.0%          56.0%          0.0%
  16    [ Both       ]  [ None ]         67.0%          34.0%          0.0%
  17    [ Multicast  ]  [ 10%  ]         65.0%          48.0%         45.0%
  18    [ Both       ]  [ None ]         77.0%          74.0%         60.0%
  19    [ Both       ]  [ 10%  ]         80.0%          89.0%         90.0%
  20    [ Both       ]  [ None ]         78.0%          83.0%         98.0%
  21    [ Broadcast  ]  [ None ]         98.0%          88.0%         44.0%
  22    [ Both       ]  [ None ]         34.0%          93.0%          0.0%
  23    [ Both       ]  [ None ]         65.0%          82.0%         56.0%
  24    [ Multicast  ]  [ None ]         76.0%          65.0%         50.0%
  25    [ Both       ]  [  5%  ]         88.0%          67.0%          0.0%
  26    [ Both       ]  [ None ]         35.0%          45.0%         90.0%
  27    [ Both       ]  [ None ]         25.0%          48.0%         78.0%
  28    [ Both       ]  [ None ]         17.0%          77.0%         89.0%
  Switch[ Both       ]  [ None ]
  Stack [ Both       ]  [ None ]

Press Ctrl-P to display choices for ports 1-14.
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main
Menu..
```

You can use this screen to view the percentage of either packet type (or both packet types) received on each port.

When the volume of either packet type is high, placing severe strain on the network (often referred to as a “storm”), you can set the forwarding rate of those packet types to *not exceed* a specified percentage of the total available bandwidth. Table 35 describes the Rate Limiting Configuration screen fields.

Table 35 Rate Limiting Configuration screen fields

Field	Description
Port	Indicates the switch port numbers that correspond to the field values in that row of the screen (for example, the field values in row 2 apply to switch port 2). Note that the values applied in the Switch or Stack row (last 2 rows) affect all standalone switch ports or all switch ports in a stack.
Packet Type	Allows you to select the packet types for rate-limiting or viewing. Default Value Both Range Both, Multicast, Broadcast
Limit	Sets the percentage of port bandwidth allowed for forwarding the packet types specified in the Packet Type field. When the threshold is exceeded, any additional packets (specified in the Packet Type field) are discarded[1]. Default Value None Range None, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1%
Last 5 Minutes	This read-only field indicates the percentage of packets (of the type specified in the Packet Type field) received by the port in the last 5 minutes. This field provides a running average of network activity and is updated every 15 seconds. Note that this field indicates the receiving port's view of network activity, regardless of the rate-limiting setting.
Last Hour	This read-only field indicates the percentage of packets (of the type specified in the Packet Type field) received by the port in the last hour. This field provides a running average of network activity and is updated every 5 minutes. Note that this field indicates the receiving port's view of network activity, regardless of the rate-limiting setting.
Last 24 Hours	This read-only field indicates the percentage of packets (of the type specified in the Packet Type field) received by the port in the last 24 hours. This field provides a running average of network activity and is updated every hour. Note that this field indicates the receiving port's view of network activity, regardless of the rate-limiting setting.

1 rate-limiting is disabled if this field is set to None. This allows you to select and view the percentage of specific packet types present in the network, without inadvertently limiting the forwarding rate.

IGMP Configuration Menu screen

The IGMP Configuration Menu screen (Figure 86) allows you to select the appropriate screen to optimize IP Multicast packets in a bridged Ethernet environment (see “IGMP snooping” on page 89).

To open the IGMP Configuration Menu screen:

➨ Choose IGMP Configuration (or press g) from the Switch Configuration Menu screen.

Figure 86 IGMP Configuration Menu screen

```
                          IGMP Configuration Menu


                       IGMP Configuration...
                       Display Multicast Group Membership
                       Return to Switch Configuration Menu



Use arrow keys to highlight option, press <Return> or <Enter> to select
option.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

Table 36 describes the IGMP Configuration Menu screen options.

Table 36 IGMP Configuration Menu screen options

Option	Description
IGMP Configuration...	Displays the IGMP Configuration screen (see "IGMP Configuration screen" on page 188). This screen allows you to set up IGMP VLAN configurations.
Display Multicast Group Membership...	Displays the Multicast Group Membership screen (see"Multicast Group Membership screen" on page 191. This screen allows you to view all IP Multicast addresses that are active in the current LAN.
Return to Switch Configuration Menu	Exists the IGMP Configuration Menu screen and displays the Switch Configuration Menu screen.

IGMP Configuration screen

Figure 87 shows an example of the IGMP Configuration screen in a stacked configuration. When installed as a standalone switch, the screen does not display the Unit # field designation.

In this example, switch ports 8 and 14 of unit 1, ports 2 and 6 of unit 2, and port 16 of unit 4 are set to receive/transmit multicast from the local multicast router. The configured ports are VLAN port members of VLAN 5.

To open the IGMP Configuration screen:

➨ Choose IGMP Configuration (or press g) from the Switch Configuration Menu screen.

Figure 87 IGMP Configuration screen

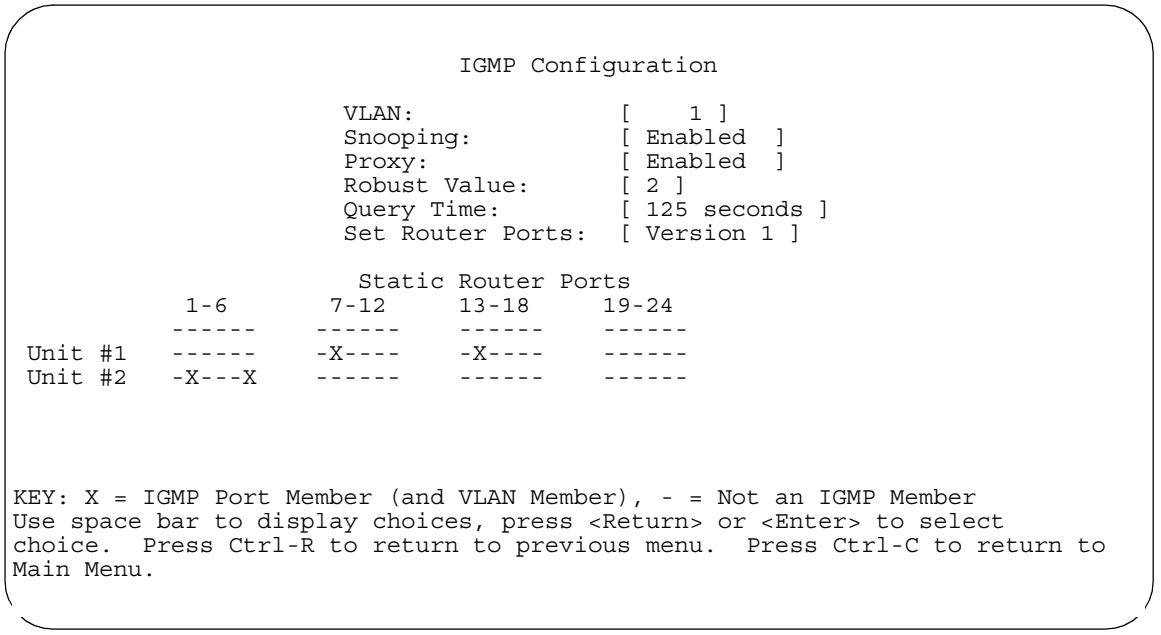

IGMP Configuration
VLAN: [1]
Snooping: [Enabled]
Proxy: [Enabled]
Robust Value: [2]
Query Time: [125 seconds]
Set Router Ports: [Version 1]
Static Router Ports
1-6 7-12 13-18 19-24
Unit #1 -X---- -X---- ------
Unit #2 ------ ------ ------
KEY: X = IGMP Port Member (and VLAN Member), - = Not an IGMP Member
Use space bar to display choices, press <Return> or <Enter> to select choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 37 describes the IGMP Configuration screen fields.

Table 37 IGMP Configuration screen fields

Field	Description
VLAN	Allows you to set up or view IGMP VLAN configurations on specified VLANs. You can use the space bar to toggle to any *existing* IGMP VLAN configurations (the maximum number of VLANs that can be displayed is 64). Default 1 Range 1 to 4094
Snooping	Allows you to enable or disable IGMP Snooping. This field affects all VLANs (for example, if you disable snooping on the VLAN specified in the screen's VLAN field, ALL VLANs are disabled for snooping). Default Value Enabled Range Enabled, Disabled

Table 37 IGMP Configuration screen fields (continued)

Field	Description
Proxy	Allows the switch to consolidate IGMP Host Membership Reports received on its downstream ports and to generate a consolidated proxy report for forwarding to its upstream neighbor. This field affects all VLANs (for example, if you disable proxy on the VLAN specified in the screen's VLAN field, ALL VLANs are disabled for proxy). The Proxy field cannot be disabled unless the Snooping field is Enabled. Default Value Enabled Range Enabled, Disabled
Robust Value	Allows a user to set the switch to offset expected packet loss on a subnet. If packet losses on a subnet are unacceptably high, the Robust Value field can be increased to a higher value. This field affects only the VLAN specified in the screen's VLAN field (for example, if you change the robust value on the VLAN specified in the screen's VLAN field, other VLANs are not affected). Default Value 2 Range 1 to 64
Query Time	Allows a user to control the number of IGMP messages allowed on the subnet by varying the *Query Interval* (the Query Interval is the interval between general queries sent by the multicast router). This field affects only the VLAN specified in the screen's VLAN field (for example, if you change the Query Time value field on the VLAN specified in the screen's VLAN field, other VLANs are not affected). Default Value 125 seconds Range 1 to 512 seconds
Set Router Ports	Selects the IGMP version according to the IGMPv1 (Version 1) or IGMPv2 (Version 2) standard (see RFC 2236). Use this field in conjunction with the Static Router Ports field (see next field description) to select the IGMP version to set. You can also use this field to view which static router ports are set to Version 1 or to Version 2. Use the space bar to toggle between the two versions and view the static router ports settings. This field affects all VLANs (for example, if you change the value of the Set Router Ports field on the VLAN specified in the screen's VLAN field, ALL VLANs are affected). Default Value Version 1 Range Version 1, Version 2

Table 37 IGMP Configuration screen fields (continued)

Field	Description
Static Router Ports	Allows a user to assign switch ports to any port that has a path to a multicast router. When the unit is part of a stack configuration, the screen displays the unit numbers of the switches configured in the stack, along with the corresponding ports. The configured ports do not filter any IP Multicast traffic. The Static Router Ports fields are displayed in six-port groups (for example, 1-6, 7-12, 13-18). The number of ports displayed depends on the switch model or type of optional MDA that is installed in the Uplink Module slot. This field affects all VLANs (for example, if you assign a port as a static router port in this screen, the port becomes a static router port for the VLAN specified in the screen's VLAN field, and also for any other VLAN where this port is a member). Default Value - Range -, X

Multicast Group Membership screen

The Multicast Group Membership screen allows you to view configured IP Multicast group addresses for specific VLANs. The screen displays the IP Multicast group addresses associated with ports that are configured within a standalone switch or a stack of switches. The displayed addresses are dynamic and can change as clients join (or leave) the various IP Multicast groups.

To open the Multicast Group Membership screen:

➨ Choose Display Multicast Group Membership (or press d) from the IGMP Configuration Menu screen.

Figure 88 Multicast Group Membership screen

```
                      Multicast Group Membership

                       VLAN: [   1  ]
 Multicast Group Address          Port
 -------------------------        ----------------
 277.37.32.6                      Unit:  1  Port:  1
 277.37.32.5                      Unit:  1  Port:  1
 277.37.32.4                      Unit:  1  Port:  1
 277.37.32.3                      Unit:  1  Port:  1
 277.37.32.2                      Unit:  1  Port:  1
 277.37.32.1                      Unit:  1  Port:  1

Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

Table 38 describes the Multicast Group Membership screen options.

Table 38 Multicast Group Membership screen options

Option	Description
VLAN	Allows you to view multicast group addresses on specified VLANs. You can use the space bar to view group addresses for any existing IGMP VLAN configurations (the maximum number of VLANs that can be displayed is 64).
Multicast Group Address	Displays all of the IP Multicast group addresses that are currently active on the associated port.
Port	Displays the port numbers that are associated with the IP Multicast group addresses displayed in the IP Multicast group address field.

Port Statistics screen

The Port Statistics screen (Figure 89) allows you to view detailed information about any switch or port in a stacked or standalone configuration. The screen is divided into two sections (Received and Transmitted) so that you can compare and evaluate throughput or other port parameters. All screen data is updated approximately every 2 seconds.

You can use the Port Statistics screen to clear (reset to zero) port counters for a specific switch or port. Alternatively, you can use the Clear All Port Statistics option to clear port counters for all switches or ports (see "Switch Configuration Menu screen" on page 135).

To open the Port Statistics screen:

➨ Choose Display Port Statistics (or press d) from the Switch Configuration Menu screen.

Figure 89 Port Statistics screen

```
                              Port Statistics
                          Unit: [ 2 ]  Port: [  1  ]
             Received                                  Transmitted
-------------------------------------------------------------------------
Packets:                                0    Packets:                   0
Multicasts:                             0    Multicasts:                0
Broadcasts:                             0    Broadcasts:                0
Total Octets:                           0    Total Octets:              0
Lost Packets:                           0
Packets 64 bytes:                       0    Packets 64 bytes:          0
        65-127 bytes                    0            65-127 bytes       0
        128-255 bytes                   0            128-255 bytes      0
        256-511 bytes                   0            256-511 bytes      0
        512-1023 bytes                  0            512-1023 bytes     0
        1024-1518 bytes                 0            1024-1518 bytes    0
FCS Errors:                             0    Collisions:                0
Undersized Packets:                     0    Single Collisions:         0
Oversized Packets:                      0    Multiple Collisions:       0
Filtered Packets:                       0    Excessive Collisions:      0
Flooded Packets:                        0    Deferred Packets:          0
Frame Errors:                           0    Late Collisions:           0

Use space bar to display choices or enter text.  Press Ctrl-Z to zero
counters.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to
return to Main Menu.
```

Table 39 describes the Port Statistics screen fields.

Note: In a stacked configuration, the Port Statistics screen appears in a slightly different format when the port selected in the Unit/Port field is configured with a Gigabit MDA.

Table 39 Port Statistics screen fields

Field	Description
Unit	Only appears if the switch is participating in a stack configuration. The field allows you to select the number of the unit you want to view or configure. To view or configure another unit, type its unit number and press [Enter], or press the spacebar on your keyboard to toggle the unit numbers.
Port	Allows you to select the number of the port you want to view or reset to zero. To view another port, type its port number and press [Enter], or press the spacebar on your keyboard to toggle the port numbers.
Packets	Received column: Indicates the total number of packets received on this port, including bad packets, broadcast packets, and multicast packets. Transmitted column: Indicates the total number of packets transmitted successfully on this port, including broadcast packets and multicast packets.
Multicasts	Received column: Indicates the total number of good multicast packets received on this port, excluding broadcast packets. Transmitted column: Indicates the total number of multicast packets transmitted successfully on this port, excluding broadcast packets.
Broadcasts	Received column: Indicates the total number of good broadcast packets received on this port. Transmitted column: Indicates the total number of broadcast packets transmitted successfully on this port.
Total Octets	Received column: Indicates the total number of octets of data (including data in bad packets) received on this port, excluding framing bits but including FCS octets. Transmitted column: Indicates the total number of octets of data transmitted successfully on this port, including FCS octets.
Lost Packets	Received column: Indicates the total number of packets lost (discarded) when the capacity of the port receive buffer was exceeded. Transmitted column: Indicates the total number of packets lost (discarded) when the capacity of the port transmit buffer was exceeded.
Packets 64 bytes	Received column: Indicates the total number of 64-byte packets received on this port. Transmitted column: Indicates the total number of 64-byte packets transmitted successfully on this port.
65-127 bytes	Received column: Indicates the total number of 65-byte to 127-byte packets received on this port. Transmitted column: Indicates the total number of 65-byte to 127-byte packets transmitted successfully on this port.

Table 39 Port Statistics screen fields (continued)

Field	Description
128-255 bytes	Received column: Indicates the total number of 128-byte to 255-byte packets received on this port. Transmitted column: Indicates the total number of 128-byte to 255-byte packets transmitted successfully on this port.
256-511 bytes	Received column: Indicates the total number of 256-byte to 511-byte packets received on this port. Transmitted column: Indicates the total number of 256-byte to 511-byte packets transmitted successfully on this port.
512-1023 bytes	Received column: Indicates the total number of 512-byte to 1023-byte packets received on this port. Transmitted column: Indicates the total number of 512-byte to 1023-byte packets transmitted successfully on this port.
1024-1518 bytes	Received column: Indicates the total number of 1024-byte to 1518-byte packets received on this port. Transmitted column: Indicates the total number of 1024-byte to 1518-byte packets transmitted successfully on this port.
Frame Errors	Indicates the total number of valid-size packets that were received but discarded because of CRC errors and improper framing.
Undersized Packets	Indicates the total number of packets received on this port with fewer than 64 bytes and with proper CRC and framing (also known as short frames or runts).
Oversized Packets	Indicates the total number of packets received on this port with more than 1518 bytes and with proper CRC and framing (also known as oversized frames).
Filtered Packets	Indicates the number of packets filtered (not forwarded) by this port.
Flooded Packets	Indicates the total number of packets flooded (forwarded) through this port because the destination address was not in the address database.
FCS Errors	Indicates the total number of valid-size packets that were received with proper framing but discarded because of cyclic redundancy check (CRC) errors.
Collisions	Indicates the total number of collisions detected on this port.
Single Collisions	Indicates the total number of packets that were transmitted successfully on this port after a single collision.
Multiple Collisions	Indicates the total number of packets that were transmitted successfully on this port after more than one collision.
Excessive Collisions	Indicates the total number of packets lost on this port due to excessive collisions.
Deferred Packets	Indicates the total number of frames that were delayed on the first transmission attempt, but never incurred a collision.
Late Collisions	Indicates the total number of packet collisions that occurred after a total length of time that exceeded 512 bit-times of packet transmission.

Table 39 Port Statistics screen fields (continued)

Field	Description
The following field values appear only when the port selected in the Unit/Port field is configured with a Gigabit MDA.	
Pause Frames	Transmitted column: Indicates the total number of pause frames transmitted on this port. Pause frames cause the transmitting port to temporarily suspend the transmission of packets when the receiving port's frame buffer is full (Gigabit ports only). Received column: Indicates the total number of pause frames received on this port. Pause frames cause the transmitting port to temporarily suspend the transmission of packets when the receiving port's frame buffer is full (Gigabit ports only).

System Log screen

The System Log screen (Figure 90) displays or clears messages obtained from system nonvolatile random access memory (NVRAM) or dynamic random access memory (DRAM) and NVRAM. When the switch is part of a stack configuration, the System screen displays only the data for the Business Policy Switch you are connected to through the Console/Comm port.

System Log messages operate as follows:

- NVRAM messages are retrievable after a system reset.
- DRAM messages can be viewed while the system is operational.
- All NVRAM and DRAM messages are time stamped.
- When you restart your system after a reset, the DRAM messages are deleted.
- After a reset, all messages stored in NVRAM are copied to DRAM (DRAM messages are not copied to NVRAM). The messages copied to DRAM are time stamped to zero (0).

To open the Event Log screen:

➨ Choose Display Event Log (or press y) from the main menu.

Figure 90 System Log screen

```
                              System Log

                     Display Unit:      [ 1 ]
               Display Messages From:   [ Non Volatile              ]
  Display configuration complete?:      [ Yes  ]
                Clear Messages From:    [ None                      ]


 Idx  Time Stamp       Type    Message
 ---  ----------      ----     ------
  1.  0D: 0H: 1M:53S   I       Warm Start Trap
  2.  0D: 0H: 1M:58S   I       Link Up Trap
  3.  0D: 0H: 1M:58S   I       Link Up Trap
  4.  0D: 0H: 1M:58S   I       Link Up Trap
  5.  0D: 0H: 1M:58S   I       Link Up Trap


Type:I(Info),S(Serious),C(Critical) Time: zero means messages from last reset
Press Ctrl-P to see previous display.  Press Ctrl-N to see more messages.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main
Menu.
```

Table 40 describes the System Log screen fields.

Table 40 System Log screen fields

Field	Description
Unit	This field only appears if the switch is participating in a stack configuration. The field allows you to select the unit number of the Business Policy Switch you want to view. To view the log messages of another Business Policy Switch, type its unit number and press [Enter], or press the spacebar on your keyboard to toggle the unit numbers.
Display Messages From	This field allows you to select the RAM source your messages are obtained from. Choose Non Volatile (NVRAM) or Volatile (DRAM) + Non Volatile. Use the spacebar to toggle between the options. Default Non Volatile Range Non Volatile, Volatile, Volatile + Non Volatile
Display configuration complete?	This field allows you to determine whether the configuration information received from NVRAM/DRAM (depending on what is selected in the Display Messages From field) is complete. Use the spacebar to toggle between the options. Default No Range No, Yes
Clear Messages From	This field allows you to clear the information messages from DRAM, NVRAM or both. If you clear DRAM messages, existing NVRAM messages are copied into DRAM. After a system reset, all existing NVRAM messages are copied to DRAM. Use the spacebar to toggle between the options. Default None Range None, NVRAM, DRAM + NVRAM

Stack Operational Mode screen

The Stack Operational Mode screen (Figure 91) displays the current configuration mode for the Business Policy Switch or mixed stack configuration. When the stack is reset, the operational mode settings do revert to the default settings.

Figure 91 Stack Operational Mode screen

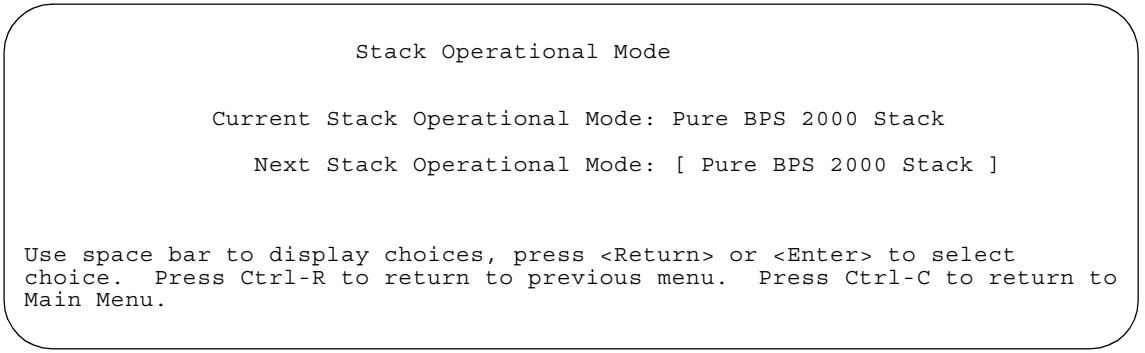

Stack Operational Mode
Current Stack Operational Mode: Pure BPS 2000 Stack
Next Stack Operational Mode: [Pure BPS 2000 Stack]
Use space bar to display choices, press <Return> or <Enter> to select choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 41 describes the Stack Operational Mode screen fields.

Table 41 Stack Operational Mode screen fields

Field	Description
Current Stack Operational Mode	A read-only field that indicates the current mode of your stack. This field identifies a stack that contains only Business Policy Switches or a stack that contains a variety of switches. Default Pure BPS 2000 Stack Range Hybrid Stack, Pure BPS 2000 Stack
Next Stack Operational Mode	Allows you to set the configuration modes of your stack. Press the spacebar to toggle between Hybrid Stack and Pure BPS 2000 Stack options. Reboot the system to implement the change. Default Pure BPS 2000 Stack Range Hybrid Stack, Pure BPS 2000 Stack

Console/Comm Port Configuration screen

The Console/Comm Port Configuration screen (Figure 92) allows you to configure and modify the console/comm port parameters and security features of a standalone switch or any participating switch in a stack configuration.

To open the Console/Comm Port Configuration screen:

➨ Choose Console/Comm Port Configuration (or press o) from the main menu.

Figure 92 Console/Comm Port Configuration screen

```
    Console/Comm Port Configuration

        Comm Port Data Bits:                  8 Data Bits
        Comm Port Parity:                     No Parity
        Comm Port Stop Bits:                  1 Stop Bit
        Console Port Speed:                   [ 2400 Baud  ]

        Console Switch Password Type:         [ None                  ]
        Console Stack Password Type:          [ None                  ]
        Telnet Switch Password Type:          [ None                  ]
        Telnet Stack Password Type:           [ None                  ]

        Console Read-Only Switch Password:    [  ]
        Console Read-Write Switch Password:   [  ]
        Console Read-Only Stack Password:     [  ]
        Console Read-Write Stack Password:    [  ]

        Primary RADIUS Server:                [ 0.0.0.0 ]
        Secondary RADIUS Server:              [ 0.0.0.0 ]
        UDP RADIUS Port:                      [ 0 ]
        RADIUS Shared Secret:                 [  ]

Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 42 describes the Console/Comm Port Configuration screen fields.

Table 42 Console/Comm Port Configuration screen fields

Field	Description
Comm Port Data Bits	A read-only field that indicates the current console/comm port data bit setting.
Comm Port Parity	A read-only field that indicates the current console/comm port parity setting.
Comm Port Stop Bits	A read-only field that indicates the current console/comm port stop bit setting.
Console Port Speed	Allows you to set the console/comm port baud rate to match the baud rate of the console terminal. Default Value: 9600 Baud Range: 2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud
	Caution: If you choose a baud rate that does not match your console terminal baud rate, you will lose communication with the configuration interface when you press [Enter]. If communication is lost, set your console terminal to match the new service port setting.

Table 42 Console/Comm Port Configuration screen fields (continued)

Field	Description
	Achtung: Bei Auswahl einer Baud rate, die nicht mit der Baudrate des Konsolenterminals übereinstimmt, geht die Kommunikation mit der Konsolenschnittstelle verloren, wenn Sie die Eingabetaste drücken. Stellen Sie in diesem Fall das Konsolenterminal so ein, daß es mit der neuen Einstellung der Service-Schnittstelle übereinstimmt.
	Attention: Si vous sélectionnez un débit différent de celui de votre terminal, vous perdrez le contact avec l'interface de votre console dès que vous appuierez sur [Entrée]. Pour restaurer la communication, alignez le débit de votre terminal sur le nouveau débit de votre port de service.
	Precaución: Si selecciona una velocidad de transmisión que no coincide con la velocidad de transmisión del terminal de la consola, perderá la comunicación con el interfaz de la consola al pulsar [Intro]. Si se pierde la comunicación, ajuste el terminal de la consola para que coincida con el nuevo valor del puerto de servicio.
	Attenzione: Nel caso in cui si scelga una velocità di trasmissione non corrispondente a quella del terminale della console, la comunicazione con l'interfaccia della console cadrà premendo il tasto [Invio]. Se la comunicazione cade, impostare il terminale della console in modo tale che corrisponda alla nuova impostazione della porta di servizio.
	注意: コンソール・ターミナルのボー・レートに合っていないボー・レートを選択すると、[Enter]を押したときに、コンソール・インタフェイスとの通信が途切れてしまいます。この場合には、新しいサービス・ポート設定に合うようにコンソール・ターミナルを設定してください。
Console Switch Password Type	Enables password protection for accessing the console interface (CI) of a *standalone switch* through a console terminal. If you set this field to Required, you can use the Logout option to restrict access to the CI. Thereafter, you will need to specify the correct password at the console-terminal prompt. See Console Read-Only Switch Password and Console Read-Write Switch Password for more information. Default Value None Range None, Local Password, RADIUS Authentication

Table 42 Console/Comm Port Configuration screen fields (continued)

Field	Description
Console Stack Password Type	Enables password protection for accessing the console interface (CI) of *any participating switch in a stack configuration* through a console terminal. If you set this field to Required, you can use the Logout option to restrict access to the CI of any stack unit. Thereafter, you will need to specify the correct password at the console-terminal prompt when accessing the stack. See Console Read-Only Stack Password and Console Read-Write Stack Password for more information. Default Value None Range None, Local Password, RADIUS Authentication
TELNET Switch Password Type	Enables password protection for accessing the console interface (CI) of a *standalone switch* through a Telnet session. If you set this field to Required, you can use the Logout option to restrict access to the CI. Thereafter, you will need to specify the correct password at the console-terminal prompt. See Console Read-Only Switch Password and Console Read-Write Switch Password descriptions for more information. Default Value None Range None, Local Password, RADIUS Authentication
TELNET Switch Password Type	Enables password protection for accessing the console interface (CI) of *any participating switch in a stack configuration*, through a Telnet session. If you set this field to Required, you can use the Logout option to restrict access to the CI of any stack unit. Thereafter, you will need to specify the correct password at the console-terminal prompt when accessing the stack. See Console Read-Only Stack Password and Console Read-Write Stack Password for more information. Default Value None Range None, Local Password, RADIUS Authentication
Console Read-Only Switch Password	When the Console Switch Password field is set to Required (for Telnet, for Console, or for Both), this field allows read-only password access to the CI of a *standalone switch*. Users can access the CI using the correct password (see default), but cannot change parameters or use the Reset option or Reset to Default option. Default Value user Range An ASCII string of up to 15 printable characters
Console Read-Write Switch Password	When the Console Switch Password field is set to Required (for Telnet, for Console, or for Both), this field allows read-write password access to the CI of a *standalone switch*. Users can log in to the CI using the correct password (see default) and can change any parameter, except the stack passwords. You can change the default passwords for read-only access and read-write access to a private password.

Table 42 Console/Comm Port Configuration screen fields (continued)

Field	Description
	Default Value: secure Range: Any ASCII string of up to 15 printable characters
	Caution: If you change the system-supplied default passwords, be sure to write the new passwords down and keep them in a safe place. If you forget the new passwords, you cannot access the console interface. In that case, contact Nortel Networks for help.
	Achtung: Wenn Sie die für das System standardmäßig eingestellten Paßwörter ändern, notieren Sie sich die neuen Paßwörter, und bewahren Sie sie an einem sicheren Ort auf. Falls Sie die neuen Paßwörter vergessen, können Sie nicht mehr auf die Konsolenschnittstelle zugreifen. Wenden Sie sich in diesem Fall an Nortel Networks, um Unterstützung zu erhalten.
	Attention: Si vous changez les mots de passe par défaut du système, assurez-vous de bien noter vos nouveaux mots de passe et de les conserver dans un endroit sûr. Si vous perdez vos nouveaux mots de passe, vous ne pourrez plus accéder à votre interface. Le cas échéant, veuillez contacter Nortel Networks.
	Precaución: Si modifica las contraseñas predeterminadas asignadas por el sistema, asegúrese de anotar las nuevas contraseñas y guárdelas en un lugar seguro. Si olvida las nuevas contraseñas, no podrá acceder al interfaz de la consola. En ese caso, póngase en contacto con Nortel Networks para obtener ayuda al respecto.
	Attenzione: In caso di modifica delle password predefinite nel sistema, assicurarsi di annotare le nuove password e di conservarle in un luogo sicuro. Nel caso in cui le nuove password vengano dimenticate, non sarà possibile accedere all'interfaccia della console. In tal caso, contattare la Nortel Networks per avere assistenza.
	注意: システム装備したデフォルトのパスワードを変更する場合、必ず新しいパスワードを書き留めて安全な場所に保管してください。新しいパスワードを忘れてしまうと、コンソール・インタフェイスにアクセスできません。この場合は、Bay Networksまでご連絡ください。

Table 42 Console/Comm Port Configuration screen fields (continued)

Field	Description
Console Read-Only Stack Password	When the Console Switch Password field is set to Required (for Telnet, for Console, or for Both), this field allows read-only password access to the CI of *any participating switch in a stack configuration*. Users can access the CI using the correct password (see default), but cannot change any parameters or use the Reset option or Reset to Default option. Default Value user Range An ASCII string of up to 15 printable characters
Console Read-Write Stack Password	When the Console Switch Password field is set to Local Password (for Telnet, for Console, or for Both), this field allows read-write password access to the CI of *any participating switch in a stack configuration*. Users can log in to the CI using the correct password (see default), and can change any parameter, except the switch password. You can change the default passwords for read-only access and read-write access to a private password. Default Value: secure Range: Any ASCII string of up to 15 printable characters
	Caution: you change the system-supplied default passwords, be sure to write the new passwords down and keep them in a safe place. If you forget the new passwords, you cannot access the console interface. In that case, contact Nortel Networks for help.
	Achtung: Wenn Sie die für das System standardmäßig eingestellten Paßwörter ändern, notieren Sie sich die neuen Paßwörter, und bewahren Sie sie an einem sicheren Ort auf. Falls Sie die neuen Paßwörter vergessen, können Sie nicht mehr auf die Konsolenschnittstelle zugreifen. Wenden Sie sich in diesem Fall an Nortel Networks, um Unterstützung zu erhalten.
	Attention: Si vous changez les mots de passe par défaut du système, assurez-vous de bien noter vos nouveaux mots de passe et de les conserver dans un endroit sûr. Si vous perdez vos nouveaux mots de passe, vous ne pourrez plus accéder à votre interface. Le cas échéant, veuillez contacter Nortel Networks.
	Precaución: Si modifica las contraseñas predeterminadas asignadas por el sistema, asegúrese de anotar las nuevas contraseñas y guárdelas en un lugar seguro. Si olvida las nuevas contraseñas, no podrá acceder al interfaz de la consola. En ese caso, póngase en contacto con Nortel Networks para obtener ayuda al respecto.

Table 42 Console/Comm Port Configuration screen fields (continued)

Field	Description
	Attenzione: In caso di modifica delle password predefinite nel sistema, assicurarsi di annotare le nuove password e di conservarle in un luogo sicuro. Nel caso in cui le nuove password vengano dimenticate, non sarà possibile accedere all'interfaccia della console. In tal caso, contattare la Nortel Networks per avere assistenza.
	注意: システム装備したデフォルトのパスワードを変更する場合、必ず新しいパスワードを書き留めて安全な場所に保管してください。新しいパスワードを忘れてしまうと、コンソール・インタフェイスにアクセスできません。この場合は、Bay Networksまでご連絡ください。
Primary RADIUS Server	The IP address of the Primary RADIUS server. Default: 0.0.0.0 (no IP address assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
Secondary RADIUS Server	The IP address of the Secondary RADIUS server. Default: 0.0.0.0 (no IP address assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
RADIUS UPD Port	The user datagram protocol (UDP) port for the RADIUS server. Default: 1645 Range: 0 to 65536
RADIUS Shared Secret	Your special switch security code that provides authentication to the RADIUS server. Default: Null string (which will not authenticate) Range: Any contiguous ASCII string that contains at least 1 printable character, up to a maximum of 35

Renumber Stack Units screen

The Renumber Stack Units screen (Figure 93) allows you to renumber the units configured in the stack. When selected, this option identifies the unit number of each unit in the stack configuration by lighting the corresponding number of (100 Mb/s port) LEDs on each unit for approximately 10 seconds. For example, unit 3 will display three LEDs.

Note: This menu option and screen appears only when the switch is participating in a stack configuration.

To open the Renumber Stack Units screen:

- Choose Renumber Stack Units (or press n) from the main menu.

Figure 93 Renumber Stack Units screen

```
                          Renumber Stack Units


  Current Unit Number              MAC Address           New Unit Number
  -------------------    ------------------------------    ---------------
        [  1  ]                 00-60-fd-77-a6-0c              [  1  ]
        [  2  ]                 00-60-fd-77-a5-f0              [  2  ]
        [  3  ]                 00-60-fd-77-a4-4c              [  3  ]
        [  4  ]                 00-60-fd-77-ab-84              [  4  ]


Renumbering stack units will cause an automatic Reset to Current Settings to
occur across the entire stack.  The current configuration will be adapted to
the new numbering scheme. Check the stack configuration after the reset to
confirm the desired configuration is set.

Are you sure you want to renumber switches with the new settings?   [ No  ]



Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 43 describes the Renumber Stack Units screen options.

Table 43 Renumber Stack Units screen options

Option	Description
Current Unit Number	Read-only fields listing the current unit number of each of the configured stack units. The entries in this column are displayed in order of their current physical cabling with respect to the base unit, and can show nonconsecutive unit numbering if one or more units were previously moved or modified. The entries can also include unit numbers of units that are no longer participating in the stack (not currently active).
MAC Address	Read-only field listing the MAC address of the corresponding unit listed in the Current Unit Number field.
New Unit Number	User-settable field showing the current unit number of each unit in the stack. You can change any of the fields, as required. You can also delete entries by typing zero (0) or using the space bar to clear the field. Default Value Current stack order Range 1 to 8
Renumber units with new setting?	Specifies whether to start the renumbering process (default is No). Use the spacebar to toggle the selection to Yes. Renumbering resets the switch with the current configuration values. When you select this option, the switch resets, runs a self-test, then displays the Nortel Networks logo screen. After you press [Ctrl]-Y at the screen prompt, the console screen temporarily displays the (standalone) Business Policy Switch main menu. Then, within 20 seconds, the console screen refreshes and displays the main menu screen for the stack configuration. The Unit LEDs display the new numbering order. Default Value No Range No, Yes

Hardware Unit Information screen

The Hardware Unit Information screen (Figure 94) lists the switch models, including any installed MDA and Cascade modules, that are configured in your standalone or stack configuration.

To open the Hardware Unit Information screen:

➨ Choose Display Hardware Units (or press h) from the main menu.

Figure 94 Hardware Unit Information screen

```
                        Hardware Unit Information


           Switch Model         MDA Model    Cascade MDA
           ----------------     ---------    -----------
 Unit #1   BPS 2000             None         400-ST1
 Unit #2   BPS 2000             None         400-ST1


Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main
Menu.
```

Spanning Tree Configuration Menu screen

The Spanning Tree Configuration Menu screen (Figure 95) allows you to view spanning tree parameters and configure individual switch ports to participate in the spanning tree algorithm (STA). To modify any of the spanning tree parameters, see your SNMP documentation.

To open the Spanning Tree Configuration Menu screen:

➡ Choose Spanning Tree Configuration (or press p) from the main menu.

Figure 95 Spanning Tree Configuration Menu screen

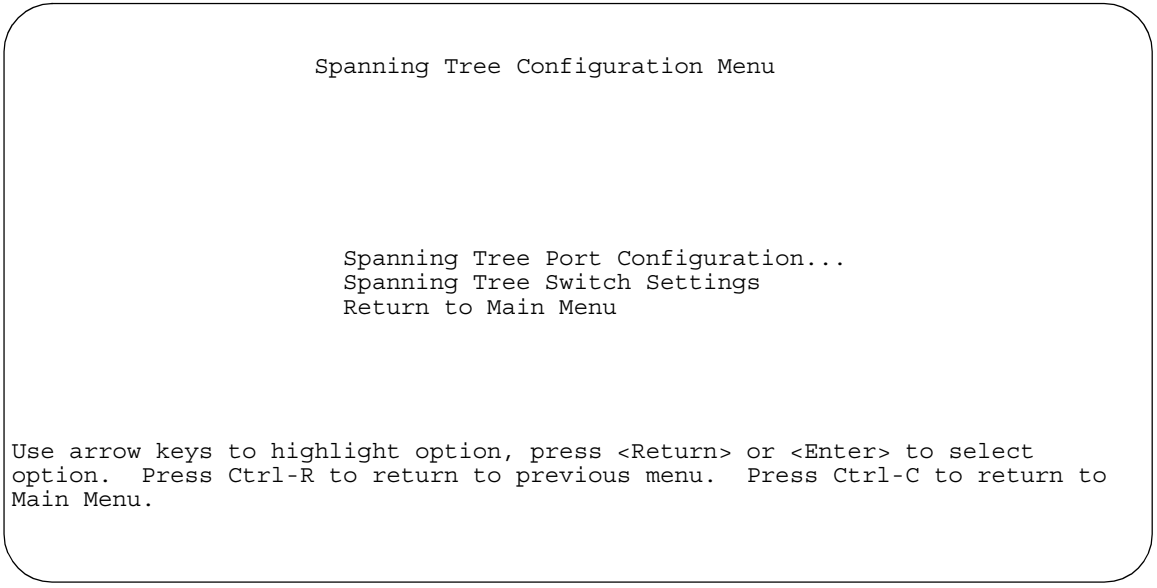

Spanning Tree Configuration Menu
Spanning Tree Port Configuration...
Spanning Tree Switch Settings
Return to Main Menu
Use arrow keys to highlight option, press <Return> or <Enter> to select option. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 44 describes the Spanning Tree Configuration Menu screen options.

Table 44 Spanning Tree Configuration Menu screen options

Option	Description
Spanning Tree Port Configuration...	Displays the Spanning Tree Port Configuration screen (see "Spanning Tree Port Configuration screen" on page 211).
Spanning Tree Switch Settings	Displays the Spanning Tree Switch Settings screen (see "Spanning Tree Switch Settings screen" on page 214).
Return to Main Menu	Exits the Spanning Tree Configuration Menu and displays the main menu.

Spanning Tree Port Configuration screen

The Spanning Tree Port Configuration screen allows you to configure individual switch ports or all switch ports for participation in the spanning tree.

Note: If spanning tree participation of any trunk member is changed (enabled or disabled), the spanning tree participation of all members of that trunk is changed similarly.

Figure 96 and Figure 97 show sample port configurations for the two Spanning Tree Port Configuration screens.

Choose Spanning Tree Port Configuration (or press c) from the Spanning Tree Configuration Menu to open the Spanning Tree Port Configuration screen.

Figure 96 Spanning Tree Port Configuration screen (1 of 2)

```
                        Spanning Tree Port Configuration

                                    Unit:  [ 1 ]
Port    Trunk       Participation        Priority    Path Cost    State
----    -----    -------------------     --------    ---------    ----------
  1              [ Normal Learning ]      128             10       Forwarding
  2              [ Normal Learning ]      128             10       Forwarding
  3              [ Normal Learning ]      128             10       Forwarding
  4              [ Normal Learning ]      128             10       Forwarding
  5              [ Normal Learning ]      128             10       Forwarding
  6              [ Normal Learning ]      128             10       Forwarding
  7              [ Normal Learning ]      128             10       Forwarding
  8              [ Normal Learning ]      128             10       Forwarding
  9              [ Normal Learning ]      128             10       Forwarding
 10              [ Normal Learning ]      128             10       Forwarding
 11              [ Normal Learning ]      128             10       Forwarding
 12              [ Normal Learning ]      128             10       Forwarding
 13              [ Normal Learning ]      128             10       Forwarding
 14              [ Normal Learning ]      128             10       Forwarding

                                                                        More...

Press Ctrl-N to display choices for additional ports..
Use space bar to display choices, press <Return> or <Enter> to select
choice.  Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to
Main Menu.
```

Figure 97 Spanning Tree Port Configuration screen (2 of 2)

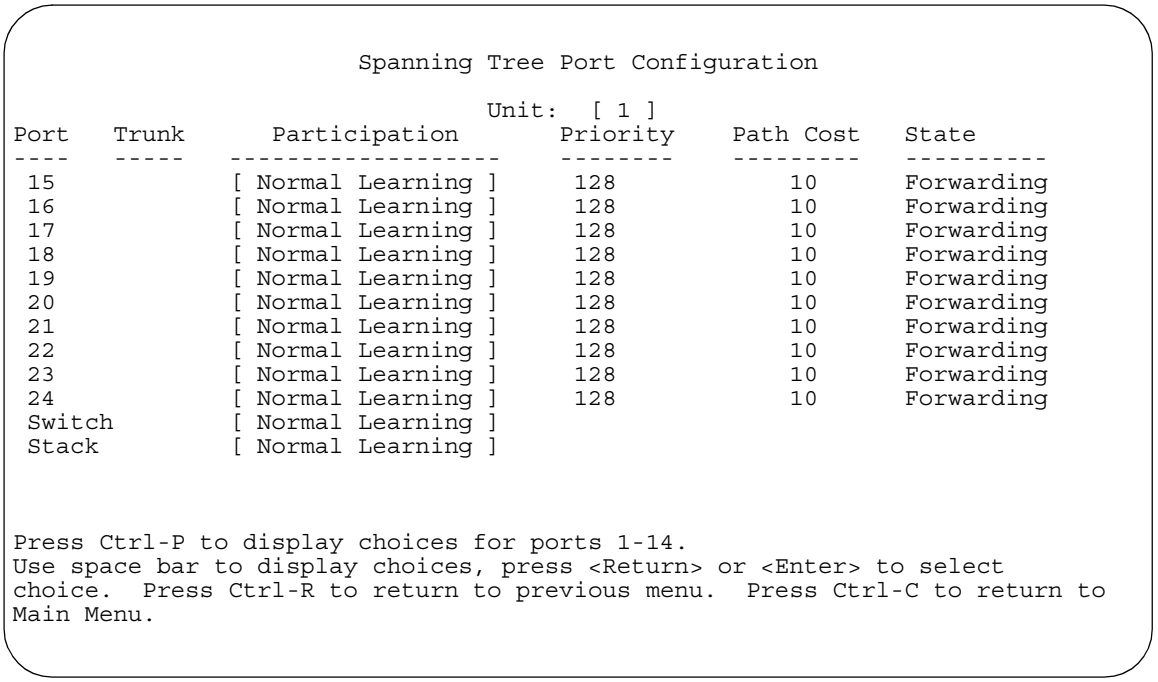

Spanning Tree Port Configuration
Unit: [1]
Port Trunk Participation Priority Path Cost State
15 [Normal Learning] 128 10 Forwarding
16 [Normal Learning] 128 10 Forwarding
17 [Normal Learning] 128 10 Forwarding
18 [Normal Learning] 128 10 Forwarding
19 [Normal Learning] 128 10 Forwarding
20 [Normal Learning] 128 10 Forwarding
21 [Normal Learning] 128 10 Forwarding
22 [Normal Learning] 128 10 Forwarding
23 [Normal Learning] 128 10 Forwarding
24 [Normal Learning] 128 10 Forwarding
Switch [Normal Learning]
Stack [Normal Learning]
Press Ctrl-P to display choices for ports 1-14.
Use space bar to display choices, press <Return> or <Enter> to select choice. Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 45 describes the Spanning Tree Port Configuration screen fields.

Table 45 Spanning Tree Port Configuration screen fields

Field	Description
Unit	This field only appears if the switch is participating in a stack configuration. The field allows you to select the number of the unit you want to view. To view another unit, type its unit number and press [Enter], or press the spacebar on your keyboard to toggle the unit numbers.
Port	Indicates the switch port numbers that correspond to the field values in that row of the screen (for example, the field values in row 2 apply to switch port 2). Note that the values in the *Switch* row affect all switch ports and, when the switch is part of a stack, the values in the *Stack* row affect all ports in the entire stack.
Trunk	The read-only data displayed in this column indicates the trunks that correspond to the switch ports specified in the Trunk Members fields of the Trunk Configuration screen (see “MultiLink Trunk Configuration Menu screen” on page 173).

Table 45 Spanning Tree Port Configuration screen fields (continued)

Field	Description
Participation	Allows you to configure any (or all) of the switch ports for Spanning tree participation. When an individual port is a trunk member (see Trunk field), changing this setting for one of the trunk members changes the setting for all members of that trunk. You should consider how this can change your network topology before you change this setting (see "MultiLink Trunking configuration rules" on page 109). The Fast Learning parameter is the same as Normal Learning, except that the state transition timer is shortened to 2 seconds. Default Value Normal Learning Range Normal Learning, Fast Learning, Disabled
Priority	This read-only field is a bridge spanning tree parameter that prioritizes the port's lowest path cost to the root. When one or more ports have the same path cost, the STA selects the path with the highest priority (lowest numerical value). See also Path Cost. Default Value 128 Range 0 to 255
Path Cost	This read-only field is a bridge spanning tree parameter that determines the lowest path cost to the root. Default Value 10 or 100 (1 for Gigabit port) Path Cost = 1000/LAN speed (in Mb/s) The higher the LAN speed, the lower the path cost. See also Priority. Range 1 to 65535
State	This read-only field indicates the current port state within the spanning tree network. Each port can transition to various states, as determined by the Participation field setting. For example, when the Participation field is set to Disabled, the port does not participate in the STA and transitions to the Forwarding state (the default). When the Participation field is set to Enabled, the port transitions from the Disabled state through the Blocking, Listening, and Learning states before entering the Forwarding state. Default Value Topology dependent Range Disabled, Blocking, Listening, Learning, Forwarding

Spanning Tree Switch Settings screen

The Spanning Tree Switch Settings screen (Figure 98) allows you to view spanning tree parameter values for the Business Policy Switch.

To open the Spanning Tree Switch Settings screen:

➨ Choose Display Spanning Tree Switch Settings (or press d) from the Spanning Tree Configuration Menu screen.

Figure 98 Spanning Tree Switch Settings screen

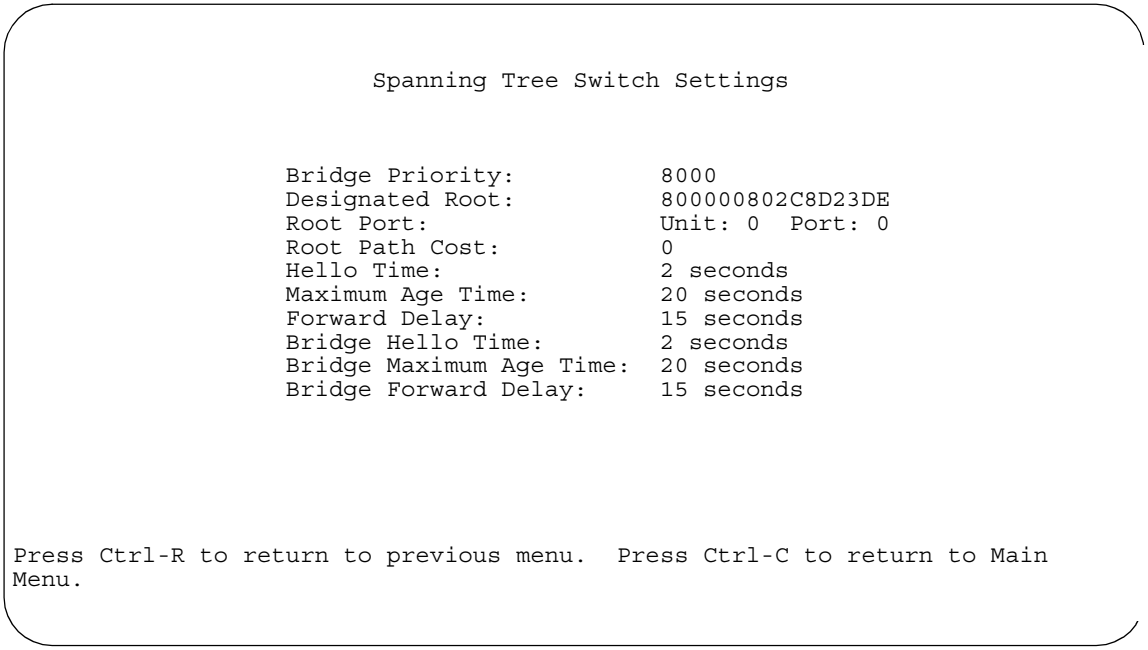

Spanning Tree Switch Settings
Bridge Priority: 8000
Designated Root: 800000802C8D23DE
Root Port: Unit: 0 Port: 0
Root Path Cost: 0
Hello Time: 2 seconds
Maximum Age Time: 20 seconds
Forward Delay: 15 seconds
Bridge Hello Time: 2 seconds
Bridge Maximum Age Time: 20 seconds
Bridge Forward Delay: 15 seconds
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 46 describes the Spanning Tree Switch Settings parameters.

Table 46 Spanning Tree Switch Settings parameters

Parameter	Description
Bridge Priority	Indicates the management-assigned priority value of the bridge ID in hexadecimal notation, which is the most significant byte of the bridge ID. The STA uses this parameter to determine the root bridge (or designated bridge). For example, the bridge with the lowest bridge ID becomes the root bridge, with Bridge Priority values compared first, followed by the hardware addresses. Default Value 8000 Range 0 to 65535
Designated Root	Indicates the bridge ID of the root bridge, as determined by the STA. Default Value 8000 (bridge_id) Range 0 to 65535
Root Port	Indicates the switch port number that offers the lowest path cost to the root bridge. Default Value 0 Range Unit: 0 Port: 28
Root Path Cost	Indicates the path cost from this switch port to the root bridge. Default Value 0 Range Not applicable
Hello Time	Indicates the Actual Hello Interval, the amount of time between transmissions of configuration Bridge Protocol Data Units (BPDUs) that the root bridge is currently using. Note that all bridges participating in the spanning tree network use the root bridge's Hello Interval parameter value. See also Bridge Hello Time. Default Value 2 seconds Range 1 to 10 seconds
Maximum Age Time	Indicates the Maximum Age Time parameter value that the root bridge is currently using. This value specifies the maximum age that a Hello message can attain before it is discarded. Note that the root bridge's Maximum Age Time parameter value becomes the actual Maximum Age Time parameter value for all bridges participating in the spanning tree network. See also Bridge Maximum Age Time. Default Value 20 seconds Range 6 to 40 seconds

Table 46 Spanning Tree Switch Settings parameters (continued)

Parameter	Description
Forward Delay	Indicates the Forward Delay parameter value that the root bridge is currently using. This value specifies the amount of time that the bridge ports remain in the Listening and Learning states before entering the Forwarding state. Note that the root bridge's Forward Delay parameter value becomes the actual Forward Delay parameter value for all bridges participating in the spanning tree network. See also Bridge Forward Delay. Default Value 15 seconds Range 4 to 30 seconds
Bridge Hello Time	Indicates the Hello Interval (the amount of time between transmissions of BPDUs) specified by management for this bridge. This parameter takes effect only when this bridge becomes the root bridge. Note that, although you can set the Hello Interval for a bridge using bridge management software, once the spanning tree computation process is complete, all bridges participating in the spanning tree network use the root bridge's Hello Interval parameter value. If any bridge becomes the root bridge, its Hello Interval parameter value becomes the Actual Hello Interval parameter value for all bridges participating in the spanning tree network. See also Hello Time. Default Value 2 seconds Range 1 to 10 seconds
Bridge Maximum Age Time	Specifies the maximum age (in seconds) that a Hello message can attain before it is discarded. This parameter, specified by management for this bridge, takes effect only when the bridge becomes the root bridge. Note that, if this bridge becomes the root bridge, its Maximum Age Time parameter value becomes the Actual Maximum Age Time parameter value for all bridges participating in the spanning tree network. See also Maximum Age Time. Default Value 20 seconds Range 6 to 40 seconds
Bridge Forward Delay	Indicates the Forward Delay parameter value specified by management for this bridge. This parameter takes effect only when this bridge becomes the root bridge. The Forward Delay parameter value specifies the amount of time that the bridge ports remain in the Listening and Learning states before entering the Forwarding state. Note that all bridges participating in the spanning tree network use the root bridge's Forward Delay parameter value. See also Forward Delay. Default Value 15 seconds Range 4 to 30 seconds

TELNET Configuration screen

The TELNET Configuration screen (Figure 99) allows a user at a remote console terminal to communicate with the Business Policy Switch as if the console terminal were directly connected to it. You can have up to four active Telnet sessions at one time.

To open the TELNET Configuration screen:

- Choose TELNET Configuration (or press t) from the main menu

Figure 99 TELNET Configuration screen

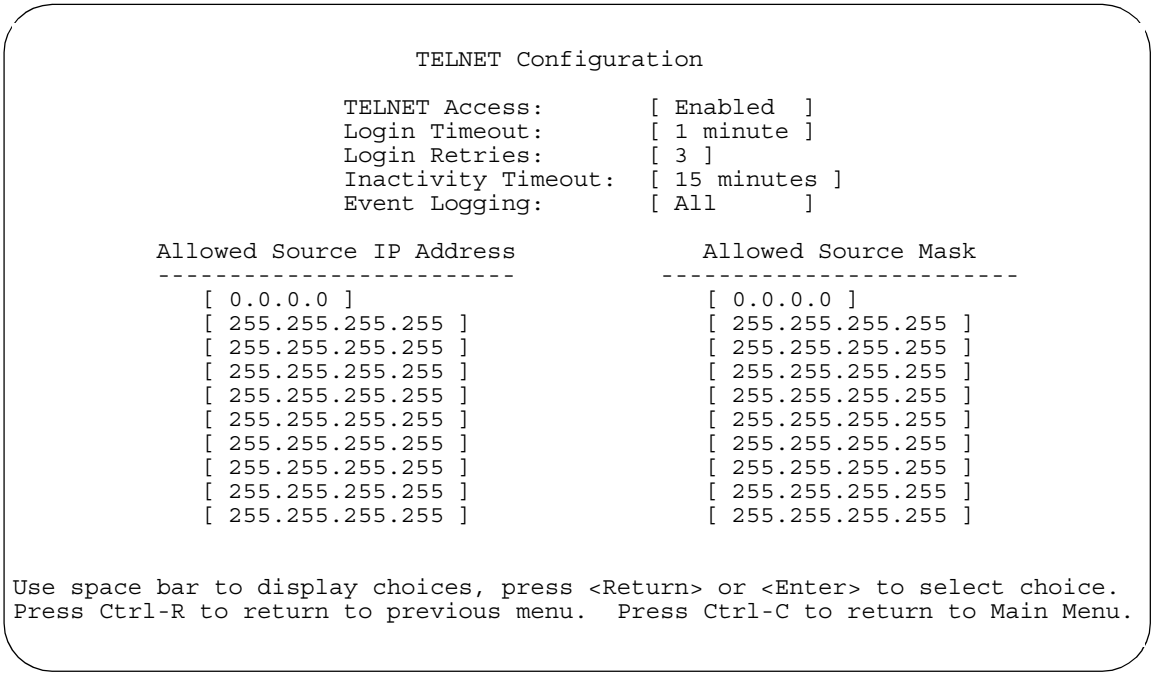

TELNET Configuration
TELNET Access: [Enabled]
Login Timeout: [1 minute]
Login Retries: [3]
Inactivity Timeout: [15 minutes]
Event Logging: [All]
Allowed Source IP Address
Allowed Source Mask
[0.0.0.0]
[255.255.255.255]
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 47 describes the TELNET Configuration screen fields.

Table 47 TELNET Configuration screen fields

Field	Description
TELNET Access	Allows a user remote access to the CI through a Telnet session. Default Value: Enabled Range: Enabled, Disabled
Login Timeout	Specifies the amount of time a user has to enter the correct password at the console-terminal prompt. Default Value: 1 minute Range: 0 to 10 minutes (0 indicates “no timeout”)
Login Retries	Specifies the number of times a user can enter an incorrect password at the console-terminal prompt before terminating the session. Default Value: 3 Range: 1 to 100
Inactivity Timeout	Specifies the amount of time the session can be inactive before it is terminated. Default Value: 15 minutes Range: 0 to 60 minutes (0 indicates “no timeout”)
Event Logging	Specifies the types of events that will be displayed in the Event Log screen (see “System Log screen” on page 197. Default Value: All Range: All, None, Accesses, Failures Description: *All:* Logs the following Telnet events to the Event Log screen: • TELNET connect: Indicates the IP address and access mode of a Telnet session. • TELNET disconnect: Indicates the IP address of the remote host and the access mode, due to either a logout or inactivity. • Failed TELNET connection attempts: Indicates the IP address of the remote host whose IP address is not on the list of allowed addresses, or indicates the IP address of the remote host that did not supply the correct password. *None:* Indicates that no Telnet events will be logged in the Event Log screen. *Accesses*: Logs only Telnet connect and disconnect events in the Event Log screen. *Failures:* Logs only failed Telnet connection attempts in the Event Log screen.

Table 47 TELNET Configuration screen fields (continued)

Field	Description
Allowed Source IP Address	Specifies up to 10 user-assigned host IP addresses that are allowed Telnet access to the CI. Default Value: 0.0.0.0 (no IP address assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
Allowed Source Mask	Specifies up to 10 user-assigned allowed source address masks. The remote IP address is masked with the Allowed Source Mask and, if the resulting value equals the Allowed Source IP address, the connection is allowed. For example, a connection would be allowed with the following settings: Remote IP address = 192.0.1.5 Allowed Source IP Address = 192.0.1.0 Allowed Source Mask = 255.255.255.0 Default Value: 0.0.0.0 (no IP mask assigned) Range: Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point

Software Download screen

The Software Download screens (Figure 100 and Figure 101) allow you to revise the Business Policy Switch software image that is located in nonvolatile flash memory.

Caution: Do not interrupt power to the device during the software download process. If the power is interrupted, the firmware image can become corrupted.

Achtung: Unterbrechen Sie die Stromzufuhr zum Gerät nicht, während die Software heruntergeladen wird. Bei Unterbrechung der Stromzufuhr kann das Firmware-Image beschädigt werden.

Attention: Ne pas couper l'alimentation de l'appareil pendant le chargement du logiciel. En cas d'interruption, le programme résident peut être endommagé.

Precaución: No interrumpa la alimentación del dispositivo durante el proceso de descarga del software. Si lo hace, puede alterar la imagen de la programación (firmware).

Attenzione: Non interrompere l'alimentazione elettrica al dispositivo durante il processo di scaricamento del software. In caso di interruzione, l'immagine firmware potrebbe danneggiarsi.

注意: ソフトウェアをダウンロードしているとき、ディバイスへの電源を切らないでください。電源を切ると、ファームウェアのイメージを損う恐れがあります。

To download the software image, you need a properly configured Trivial File Transfer Protocol (TFTP) server in your network, and an IP address for the switch (or stack, if configured). To learn how to configure the switch or stack IP address, refer to “IP Configuration/Setup screen” on page 126.

To open the Software Download screen:

➨ Choose Software Download (or press f) from the main menu.

You can monitor the software download process by observing the LEDs (see “LED Indications during the download process” on page 223).

Figure 100 Software Download screen for a Business Policy Switch-only stack

```
                  Software Download



       BPS 2000 Image Filename:            [  ]
       BPS 2000 Diagnostics Filename:      [  ]

       TFTP Server IP Address:             [ 0.0.0.0 ]

       Start TFTP Load of New Image:       [ No                    ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Figure 101 Software Download screen for a mixed stack

```
                       Software Download



       BPS 2000 Image Filename:            [  ]
       BPS 2000 Diagnostics Filename:      [  ]
       450 Image Filename:                 [  ]
       TFTP Server IP Address:             [ 10.170.119.5 ]

       Start TFTP Load of New Image:       [ No                    ]



Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Table 48 describes the Software Download screen fields.

Table 48 Software Download screen fields

Field	Description
BPS 2000 Image Filename	The Business Policy Switch software image load file name. **NOTE:** Certain software releases may require you to download two images: the *boot code image* and the *agent image*. For proper operation of the switch, the new boot code image must be downloaded *before* the agent image is downloaded. Default Value Zero-length string Range An ASCII string of up to 30 printable characters
BPS 2000 Diagnostics Filename	The Business Policy Switch diagnostics file name. Default Value Zero-length string Range An ASCII string of up to 30 printable characters
450 Image Filename	The BayStack 450 software image load file name. Displays in a mixed stack environment. **NOTE:** Certain software releases may require you to download two images: the *boot code image* and the *agent image*. For proper operation of the switch, the new boot code image must be downloaded *before* the agent image is downloaded. Default Value Zero-length string Range An ASCII string of up to 30 printable characters
TFTP Server IP Address	The IP address of your TFTP load host. Default Value 0.0.0.0 (no IP address assigned) Range Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
Start TFTP Load of New Image	Specifies whether to start the download of the switch software image (default is No). Use the spacebar to toggle the selection to Yes. Press [Enter] to initiate the software download process.
	NOTE: The software download process can take up to 60 seconds to complete (or more if the load host path is congested or there is a high volume of network traffic).
	To ensure that the download process is not interrupted, do not power down the switch for approximately 10 minutes. Default Value No Range Yes, No

LED Indications during the download process

The software download process automatically completes without user intervention. The process erases the contents of flash memory and replaces it with a new software image. Be careful not to interrupt the download process until after it runs to completion (the process can take up to 10 minutes, depending on network conditions).

Note: If problems occur during the software download process, the Software Download screen displays error codes that define the problem. The error codes are described in Chapter 5, "Troubleshooting."

During the download process, the Business Policy Switch is not operational. You can monitor the progress of the download process by observing the LED indications.

Configuration File Download/Upload screen

The Configuration File Download/Upload screen (Figure 102) allows you to store your switch/stack configuration parameters on a TFTP server.

You can retrieve the configuration parameters of a standalone switch or an entire stack and use the retrieved parameters to automatically configure a replacement switch or stack. Certain requirements apply when automatically configuring a switch or stack using this feature (see "Requirements" on page 226). You must set up the file on your TFTP server and set the filename read/write permission to enabled before you can save the configuration parameters.

Although most configuration parameters are saved to the configuration file, certain parameters are not saved (see Table 50 on page 227).

To open the Configuration File Download/Upload screen:

➨ Choose Configuration File (or press g) from the main menu.

Figure 102 Configuration File Download/Upload screen

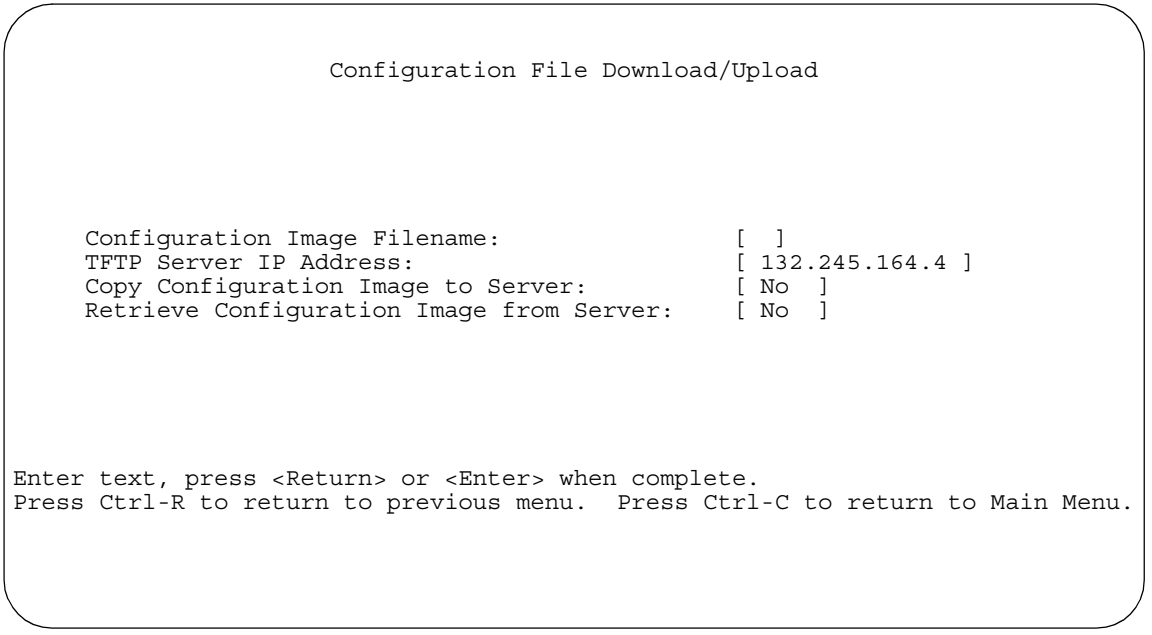

Configuration File Download/Upload
Configuration Image Filename: [ ]
TFTP Server IP Address: [132.245.164.4]
Copy Configuration Image to Server: [No]
Retrieve Configuration Image from Server: [No]
Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Table 49 describes the Configuration File Download/Upload screen fields.

Table 49 Configuration File Download/Upload screen fields

Field	Description
Configuration Image Filename	The file name you have chosen for the configuration file. Choose a meaningful file name that will allow you to identify the file for retrieval when required. The file must already exist on your TFTP server and must be read/write enabled. Default Value Zero-length string Range An ASCII string of up to 30 printable characters
TFTP Server IP Address	The IP address of your TFTP load host. Default Value 0.0.0.0 (no IP address assigned) Range Four-octet dotted-decimal notation, where each octet is represented as a decimal value, separated by a decimal point
Copy Configuration Image to Server	Specifies whether to copy the presently configured switch/stack parameters to the specified TFTP server (default is No). Use the spacebar to toggle the selection to Yes. Press [Enter] to initiate the process. Default Value No Range Yes, No
Retrieve Configuration Image from Server	Specifies whether to retrieve the stored switch/stack configuration parameters from the specified TFTP server (default is No). If you choose Yes, the download process begins immediately and, when completed, causes the switch/stack to reset with the new configuration parameters. Use the spacebar to toggle the selection to Yes. Press [Enter] to initiate the process. Default Value No Range Yes, No

Requirements

The following requirements apply to the Configuration File feature:

- The Configuration File feature can only be used to copy *standalone switch configuration parameters to other standalone switches* or to copy *stack configuration parameters to other stack configurations*.

  For example, you cannot duplicate the configuration parameters of a unit in a *stack* configuration and use it to configure a *standalone* switch.

- A configuration file obtained from a standalone switch can only be used to configure other standalone switches that have the same firmware revision and model type as the donor standalone switch.
- A configuration file obtained from a stack unit can only be used to configure other stacks that have the same number of switches, firmware version, model types, and physical IDs as the stack the donor stack unit resides in.

  Reconfigured stacks are configured according to the unit order number of the donor unit. For example, the configuration file parameters from a donor unit with physical ID *x* are used to reconfigure the unit with physical ID *x*.

- The configuration file also duplicates any settings that exist for any MDA that is installed in the donor switch.

  If you use the configuration file to configure another switch that has the same MDA model installed, the configuration file settings will also apply to and override the existing MDA settings.

Table 50 describes configuration file parameter information.

Table 50 Parameters not saved to the configuration file

These parameters are not saved:	Used in this screen:	See page:
In-Band Stack IP Address	IP Configuration/Setup	126
In-Band Switch IP Address		
In-Band Subnet Mask		
Default Gateway		
Console Read-Only Switch Password	Console/Comm Port Configuration	200
Console Read-Write Switch Password		
Console Read-Only Stack Password		
Console Read-Write Stack Password		
Configuration Image Filename	Configuration File Download/Upload	223
TFTP Server IP Address		

Chapter 4
Configuring policy-enabled networks

This chapter provides an overview of differentiated services' Quality of Service network architecture. The Business Policy Switch provides a Web-based management interface to configure policies. See *Using Web-based Management for the Business Policy Switch 2000* for detailed information. In addition to Web-based management, policies can be configured using SNMP and Common Open Policy Services (COPS).

This chapter includes information about the following topics:

- "Differentiated Services (DiffServ) overview" (this page)
- "Policy overview" (page 230)
- "Configuring policy parameters" (page 232)

Differentiated Services (DiffServ) overview

Differentiated services (DiffServ) is a Quality of Service (QoS) network architecture that offers varied levels of service for different types of data traffic. DiffServ lets you designate a specific level of performance on a packet-by-packet basis instead of using the "best-effort" model for your data delivery. You can give preferential treatment (prioritization) to applications that require high performance and reliable service, such as voice and video over IP.

The Business Policy Switch includes the capability to enhance your network traffic management. For each packet, there is an octet in the packet header, the DiffServ (DS) field, that you can designate for specific service. For IP packets, six bits of the DS field is the DiffServ Code Point (DSCP). The DSCP value defines how the packet is to be treated as it travels through the network. You can set traffic criteria to match the DS field, and policy actions to change the DS field to conform to various other mappings.

COPS

When used with the Optivity Policy Services® (OPS) Version 1.2 or later, a comprehensive network management application combining IP address management with policy-based network traffic control, the Business Policy Switch 2000 effectively manages network traffic and resources. Information is transferred using the Common Open Policy Services (COPS) protocol, a query and response protocol that exchanges policy information messages using the Transmission Control Protocol (TCP). Specifically, COPS for Provisioning (COPS-PR) is used to download information. COPS is used to communicate with edge devices on the network.

OPS provides a centralized management point for DiffServ policies. The policy server distributes policies to edge devices and border routers. These edge devices police traffic flows by marking packets and applying forwarding behaviors to the packets at the network node.

For further information about Optivity products, contact your Nortel Networks sales representative.

Policy overview

Use the Web-based management interface or SNMP to configure policies and filters to control the behavior of network traffic. A *policy* is a network traffic controlling mechanism that monitors the characteristics of the traffic (for example, its source, destination, and protocol) and performs a controlling action on the traffic when certain user-defined characteristics are matched. A *policy action* is the effect a policy has on network traffic that matches the traffic profile of the policy. You can assign only one action to a policy. You set up *filters* to establish packet-specific criteria that determine how a packet is to be processed. You can use filters to remark packets by updating the DSCP code points, to change priorities and loss sensitivity (drop precedence), or to drop packets.

LAN ports on the Business Policy Switch are configured according to the policy determining traffic priorities. As packets enter the switch, they are marked according to their priority. The levels are Premium, Platinum, Gold, Silver, Bronze, and Best Effort. Each level corresponds to a packet queue: Premium (the highest, typically used for voice traffic), Platinum (for video traffic), Silver (for FTP packets), and Best Effort (for e-mail traffic).

After the packets are marked, they are moved to the proper egress queue based on their marking. When a packet is to be transmitted, the switch looks at the Premium queue first. Then the Business Policy Switch examines the other queues and sends packets based on the weighted percentage that has been configured for the queues. The entire process is repeated. This approach ensures that the Premium packets are serviced quickly and that the other data types (other queues) are not starved and serviced in a round-robin fashion.

A packet is processed as follows:

1. The packet enters the Business Policy Switch.
2. Filters are applied.
3. Filter actions are taken and the packet can be modified (IEEE 802.1p, DSCP).
4. The packet is assigned a QoS class (Premium, Platinum, Gold, Silver, Bronze, Best Effort). A QoS class is designated using the DSCP and/or IEEE 802.1p user priority values.
5. The packet is placed in the appropriate egress queue according to its priority marking as described above.
6. The queues are serviced in a round-robin fashion (strict priority or weighted round robin).

Refer to *Using Web-based Management for the Business Policy Switch 2000* for detailed information about using the Web-based management interface.

Configuring policy parameters

When network traffic attributes match those specified in a traffic pattern, the policy instructs the network device to perform a specified action on each packet that passes through it. The Web-based management application (Application > QoS) provides two options to configure QoS parameters. The Wizard option leads you through a series of screens presenting simple configuration questions and options. This method automatically generates common QoS filters. The Advanced option allows you to define your own actions, meters, IP and layer 2 filters, filter groups, and targets.

The Business Policy Switch is shipped with limited default policy information. Defaults include basic role combination (interface group) values, default user priority-to-queue mappings for each role combination, and default DSCP-to-user priority mappings.

Chapter 5
Troubleshooting

This chapter describes how to isolate and diagnose problems with your Business Policy Switch and covers the following topics:

- Interpreting the LEDs
- Diagnosing and correcting the problem
  - — Normal power-up sequence
  - — Port connection problems

The chapter topics lead you through a logical process for troubleshooting the Business Policy Switch. For example, because LEDs provide visual indications of certain problems, see “Interpreting the LEDs” on page 233 to understand the various states (Table 51) that your switch LEDs can exhibit during normal operation.

For more help in determining the problem, “Diagnosing and correcting problems” on page 236 describes symptoms and corrective actions (Table 52) you can perform to resolve specific problems. Subsequent sections give step-by-step procedures to correct the problems.

Interpreting the LEDs

Figure 103 shows the Business Policy Switch LED display panel. Table 51 describes the LEDs.

Figure 103 LED display panel

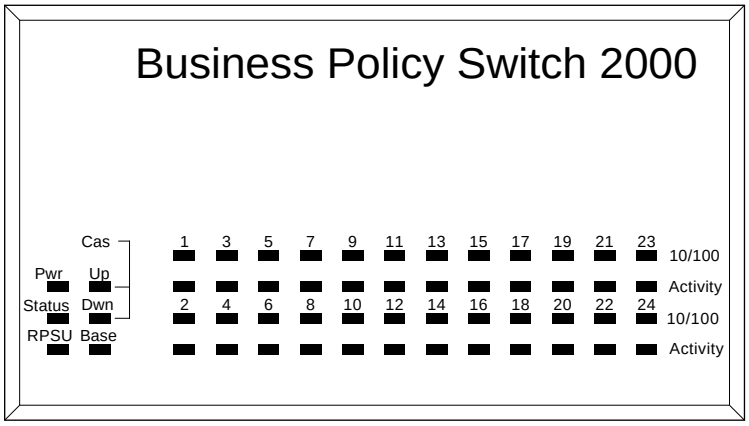


Table 51 Business Policy Switch LED descriptions

Label	Type	Color	State	Meaning
Pwr	Power status	Green	On	DC power is available to the switch's internal circuitry.
			Off	No AC power to switch or power supply failed.
Status	System status	Green	On	Self-test passed successfully and switch is operational.
			Blinking	A nonfatal error occurred during the self-test.
			Off	The switch failed the self-test.
RPSU	RPSU status	Green	On	The switch is connected to the RPSU and can receive power if needed.
			Off	The switch is not connected to the RPSU or RPSU is not supplying power.
Cas Up	Stack mode		Off	The switch is in standalone mode.
		Green	On	The switch is connected to the *upstream* unit's Cascade A In connector.
		Amber	On	This unit has detected a problem with the switch connected to the cascade up connector. In order to maintain the integrity of the stack, this unit has bypassed its upstream neighbor and has wrapped the stack backplane onto an alternate path.
		Amber or Green	Blinking	Incompatible software revision or unable to obtain a unit ID (Renumber Stack Unit table full). The unit is on the ring but cannot participate in the stack configuration.

Table 51 Business Policy Switch LED descriptions (continued)

Label	Type	Color	State	Meaning
Cas Dwn	Stack mode		Off	The switch is in standalone mode.
		Green	On	The switch is connected to the *downstream* unit's Cascade A Out connector.
		Amber	On	This unit has detected a problem with the switch connected to the cascade down connector. In order to maintain the integrity of the stack, this unit has bypassed its downstream neighbor and has wrapped the stack backplane onto an alternate path.
		Amber or Green	Blinking	Incompatible software revision or unable to obtain a unit ID (Renumber Stack Unit table full). The unit is on the ring but cannot participate in the stack configuration.
Base	Base mode	Green	On	The switch is configured as the stack base unit.
			Off	The switch is *not* configured as the stack base unit (or is in standalone mode).
			Blinking	Stack configuration error: indicates that *multiple* base units or *no* base units are configured in the stack.
		Amber	On	This unit is operating as the stack configuration's *temporary base unit*. This condition occurs automatically if the base unit (directly downstream from this unit) fails. If this happens, the following events take place: • The two units directly upstream and directly downstream from the failed unit automatically wrap their cascade connectors and indicate this condition by lighting their Cas Up and Cas Dwn LEDs (see Cas Up and Cas Dwn description in this table). • If the temporary base unit fails, the next unit directly downstream from this unit becomes the new temporary base unit. This process can continue until there are only two units left in the stack configuration. This automatic failover is a temporary safeguard only. If the stack configuration loses power, the temporary base unit will not power up as the base unit when power is restored. For this reason, you should always assign the temporary base unit as the base unit (set the Unit Select switch to Base) until the failed unit is repaired or replaced.

Table 51 Business Policy Switch LED descriptions (continued)

Label	Type	Color	State	Meaning
10/100	10/100 Mb/s port speed indicator	Green	On	The corresponding port is set to operate at 100 Mb/s and the link is good.
		Green	Blinking	The corresponding port has been disabled by software.
		Amber	On	The corresponding port is set to operate at 10 Mb/s and the link is good.
		Amber	Blinking	The corresponding port has been disabled by software.
			Off	The link connection is bad or there is no connection to this port.
Link	Link status	Green	On	Valid communications link established.
			Off	The communications link connection is bad or there is no connection to this port.
			Blinking	The corresponding port is management disabled.
Activity	Port activity	Green or Amber	Blinking	Indicates network activity for the corresponding port. A high level of network activity can cause the LEDs to appear to be on continuously.

Diagnosing and correcting problems

Before you perform the problem-solving steps in this section, cycle the power to the Business Policy Switch (disconnect and then reconnect the AC power cord); then verify that the switch follows the normal power-up sequence.

Warning: To avoid bodily injury from hazardous electrical current, never remove the top cover of the device. There are no user-serviceable components inside.

Vorsicht: Um Verletzungsgefahr durch einen elektrischen Stromschlag auszuschließen, nehmen Sie niemals die obere Abdeckung vom Gerät ab. Im Geräteinnern befinden sich keine Komponenten, die vom Benutzer gewartet werden können.

Avertissement: Pour éviter tout risque d'électrocution, ne jamais retirer le capot de l'appareil. Cet appareil ne contient aucune pièce accessible par l'utilisateur.

Advertencia: A fin de evitar daños personales por corrientes eléctricas peligrosas, no desmonte nunca la cubierta superior de este dispositivo. Los componentes internos no son reparables por el usuario.

Avvertenza: Per evitare lesioni fisiche dovute a scariche pericolose di corrente, non rimuovere mai il coperchio superiore del dispositivo. I componenti interni non possono essere manipolati dall'utente.

警告：危険な電流から身体を保護するために、ディバイスの上部カバーを決して取り外さないでください。内部には、ユーザが扱うコンポーネントはありません。

Normal power-up sequence

In a normal power-up sequence, the LEDs appear as follows:

1. After power is applied to the switch, the Pwr (Power) LED turns on within 5 seconds.
2. The switch initiates a self-test, during which the port LEDs display various patterns to indicate the progress of the self-test.
3. Upon successful completion of the self-test (within 10 seconds after power is applied), the Status LED turns on.
4. The remaining port LEDs indicate their operational status, as described in Table 52.

Table 52 Corrective actions

Symptom	Probable cause	Corrective action
All LEDs are off.	The switch is not receiving AC power.	Verify that the AC power cord is fastened securely at both ends and that power is available at the AC power outlet.
	The fans are not operating or the airflow is blocked, causing the unit to overheat.	Verify that there is sufficient space for adequate airflow on both sides of the switch.
		Note: Operating temperature for the switch must not exceed 40°C (104°F). Do not place the switch in areas where it can be exposed to direct sunlight or near warm air exhausts or heaters.
The Activity LED for a connected port is off or does not blink (and you have reason to believe that traffic is present).	The switch is experiencing a port connection problem. The switch's link partner is not autonegotiating properly.	See "Port connection problems" next.
The Status LED is off.	A fatal error was detected by the self-test.	Cycle the power to the switch (disconnect and then reconnect the AC power cord). If the problem persists, replace the switch.
The Status LED is blinking.	A nonfatal error occurred during the self-test.	Cycle the power to the switch (disconnect and then reconnect the AC power cord). If the problem persists, contact the Nortel Networks Technical Solutions Center.

Port connection problems

You can usually trace port connection problems to either a poor cable connection or an improper connection of the port cables at either end of the link. To remedy these types of problems, make sure that the cable connections are secure and that the cables connect to the correct ports at both ends of the link.

Port connection problems are also traceable to the autonegotiation mode or the port interface.

Autonegotiation modes

Port connection problems can occur when a port (or station) is connected to another port (or station) that is not operating in a compatible mode (for example, connecting a full-duplex port on one station to a half-duplex port on another station).

The Business Policy Switch negotiates port speeds according to the IEEE 802.3u autonegotiating standard. The switch adjusts (autonegotiates) its port speed and duplex mode to match the best service provided by the connected station, up to 100 Mb/s in full-duplex mode as follows:

- If the connected station uses a form of autonegotiation that is not compatible with the IEEE 802.3u autonegotiating standard, the Business Policy Switch cannot negotiate a compatible mode for correct operation.
- If the autonegotiation feature is not present or not enabled at the connected station, the Business Policy Switch may not be able to determine the correct duplex modes.

In both situations, the Business Policy Switch “autosenses” the speed of the connected station and, by default, reverts to half-duplex mode. If the connected station is operating in full-duplex mode, it cannot communicate with the switch.

To correct this mode mismatch problem:

1. Use the Port Configuration screen to disable autonegotiation for the suspect port (see “Port Configuration screen” on page 167).
2. Manually set the Speed/Duplex field to match the speed/duplex mode of the connected station (see Table 28 on page 169).

   You may have to try several settings before you find the correct speed/duplex mode of the connected station.

If the problem persists:

1. Disable the autonegotiation feature at the connected station.
2. Manually set the speed/duplex mode of the connected station to the same speed/duplex mode you have manually set for the Business Policy Switch port.

Note: Nortel Networks recommends that you manually set the Business Policy Switch port to the desired speed/duplex mode when you connect to any of the following Nortel Networks products:

- BayStack 450 product family
- BayStack 410 product family

Port interface

Ensure that the devices are connected using the appropriate crossover or straight-through cable (see Appendix F, “Connectors and pin assignments,” on page 285).

Appendix A
Technical specifications

This appendix provides technical specifications for the Business Policy Switch 2000.

Environmental

Table 53 lists environmental specifications.

Table 53 Environmental specifications

Parameter	Operating specification	Storage specification
Temperature	0° to 40°C (32° to 104°F)	-25° to 70°C (-13° to 158°F)
Humidity	85% maximum relative humidity, noncondensing	95% maximum relative humidity, noncondensing
Altitude	3024 m (10,000 ft)	3024 m (10,000 ft)

Electrical

Table 54 lists power electrical parameters for the Business Policy Switch.

Table 54 Electrical parameters

Parameter	Electrical specification
Input Voltage	100 to 240 VAC @ 47 to 63 Hz
Input Power Consumption	150 W maximum
Input Volt Amperes Rating	200 VA maximum
Input current	1.5 A @ 100 VAC .6 A @ 240 VAC
Maximum thermal output	500 BTU/hr

Physical dimensions

Table 55 lists physical dimensions.

Table 55 Physical dimensions

Parameter	Specifications
Height	7.04 cm (2.77 in.)
Width	43.82 cm (17.25 in.)
Depth	38.35 cm (15.1 in)
Weight	4.8 kg (10.60 lb)

Performance specifications

Table 56 lists performance specifications.

Table 56 Performance specifications

Parameter	Specifications
Frame Forward Rate (64-byte packets)	Up to 3.2 million packets per second (pps) maximum, learned unicast traffic
Port Forwarding/Filtering Performance (64-byte packets)	• For 10 Mb/s: 14,880 pps maximum • For 100 Mb/s: 148,810 pps maximum
Address Database Size	16,000 entries at line rate (32,000 entries without flooding)
Addressing	48-bit MAC address
Frame Length	64 to 1518 bytes (IEEE 802.1Q Untagged) 64 to 1522 bytes (IEEE 802.1Q Tagged)

Network protocol and standards compatibility

The following are protocols and standards used by the Business Policy Switch:

- IEEE 802.3 10BASE-T (ISO/IEC 8802-3, Clause 14)
- IEEE 802.3u 100BASE-TX (ISO/IEC 8802-3, Clause 25)
- IEEE 802.3u 100BASE-FX (ISO/IEC 8802-3, Clause 26)
- IEEE 802.1p (Prioritizing)
- IEEE 802.1Q (VLAN Tagging)
- IEEE 802.1z (Gigabit)

Data rate

The data rate is 10 Mb/s Manchester encoded or 100 Mb/s 4B/5B encoded.

Interface options

Table 57 lists interface options.

Table 57 Interface options

Option	Description
10BASE-T/100BASE-TX	RJ-45 (8-pin modular) connectors for MDI-X interface
100BASE-FX Fiber	SC and MT-RJ connectors for switched 100 Mb/s (100BASE-FX) connections over 50/125 and 62.5/125 micron multimode fiber optic cable (2 km/6562 ft maximum distance)
1000BASE-SX (Shortwave Gigabit Fiber) MDA	SC connectors for shortwave 850 nm fiber optic connections over multimode (550 m/1805 ft) fiber optic cable
1000BASE-LX (Longwave Gigabit Fiber) MDA	SC connectors for longwave 1300 nm fiber optic connections over single-mode (3 km/9843 ft) or multimode (550 meter/1805 ft) fiber optic cable

Safety agency certification

The safety certifications follow:

- UL Listed (UL 1950)
- IEC 950/EN60950
- C22.2 No. 950 (CUL) with all national deviations
- UL-94-V1 flammability requirements for PC board
- NOM (NOM-019)

Electromagnetic emissions

The module meets the following standards:

- US. CFR47, Part 15, Subpart B, Class A
- Canada. ICES-003, Issue 2, Class A
- Australia/New Zealand. AS/NZS 3548:1995, Class A
- Japan. V-3/97.04:1997, Class A
- Taiwan. CNS 13438, Class A
- EN55022:1995, Class A
- EN61000-3-2:1995
- EN61000-3-3:1994

Electromagnetic immunity

The module meets the EN50082-1:1997 standard.

Declaration of Conformity

The Declaration of Conformity for the Business Policy Switch 2000 complies with ISO/IEC Guide 22 and EN45014. The declaration identifies the product models, the Nortel Networks name and address, and the specifications recognized by the European community.

As stated in the Declaration of Conformity, the Business Policy Switch 2000 complies with the provisions of Council Directives 89/336/EEC and 73/23/EEC.

Appendix B
Interoperability in a mixed stack configuration

This appendix presents important interoperability guidelines when you implement a mixed stack configuration. A mixed stack consists of a combination of Business Policy Switches *and* BayStack 450 and/or BayStack 410 switches.

Setting up your mixed stack configuration

To set up a mixed stack configuration, follow the basic instructions regarding Business Policy Switch configuration detailed in Chapter 1, "The Business Policy Switch 2000," *Installing the Business Policy Switch 2000*, and *Installing the BayStack 400-ST1 Cascade Module.*

In the following sections you will find *specific* information about implementing a mixed stack configuration.

Configuration requirements

The configuration requirements described here can help you to implement your mixed stack configuration.

Base unit

In a mixed stack configuration, a Business Policy Switch *must* be configured as the base unit (Unit Select switch set to On on the cascade module). All other units in the stack *must* have their Unit Select switch set to Off. The base unit switch is the unique stack switch that you configure with the Unit Select switch on the front panel of the BayStack 400-ST1 Cascade Module. If you do not designate a Business Policy Switch as the base unit, the stack will not operate.

Merging the Business Policy Switch into a mixed stack

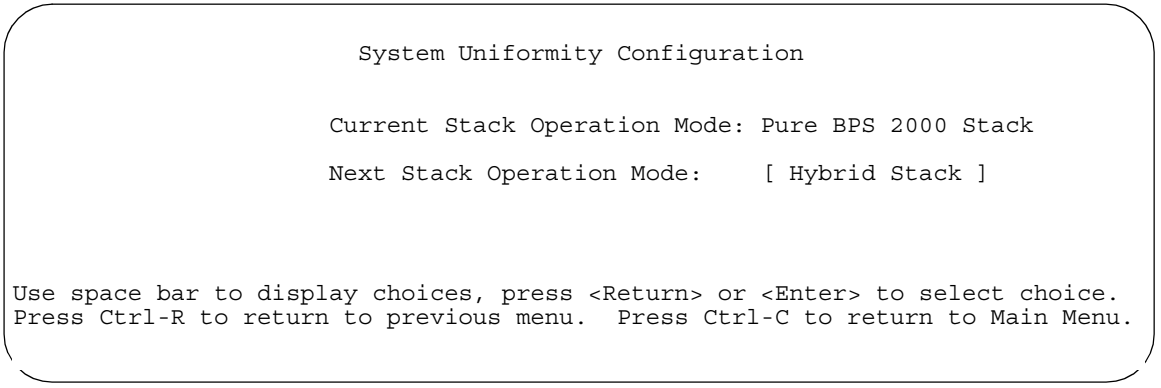
Nortel Networks recommends that you start up your Business Policy Switch initially in a standalone mode and perform preliminary IP configuration tasks before you add it to an existing stack.

Note: When you add a new (factory direct) unconfigured Business Policy Switch 2000 to your stack, the Business Policy Switch acts as the dominant unit (base unit) and *overwrites* certain configuration settings. You cannot reset the switch to its previous configurations. To recover previous configurations, you must reconfigure parameters such as MLT, VLAN, and conversation steering.

To add a Business Policy Switch to your stack:

1. Change the new Business Policy Switch base unit setting on the BayStack 400-ST1 Cascade Module to Base.
2. Ensure that no other unit in the existing stack is selected as the base unit.
3. Power up the switch.
4. Change the Stack Operational Mode field on the Business Policy Switch to **`Hybrid Stack`** (Figure 104).
5. Perform configuration tasks for:
   - IP address
   - Subnet mask
   - Gateway address
6. Reset the switch to save your changes.
7. Add the newly configured Business Policy Switch to your existing stack.

Figure 104 System Uniformity Configuration screen


System Uniformity Configuration
Current Stack Operation Mode: Pure BPS 2000 Stack
Next Stack Operation Mode: [Hybrid Stack]
Use space bar to display choices, press <Return> or <Enter> to select choice.
Press Ctrl-R to return to previous menu. Press Ctrl-C to return to Main Menu.

Automatic failover

The automatic failover is a temporary safeguard only. If the stack loses power or is reset, the temporary base unit will not power up as the base unit when power is restored. For this reason, you should always assign the temporary base unit (assign another Business Policy Switch, if available) as the base unit (set the Unit Select switch to Base) until the failed unit is repaired or replaced. When a failure of the base unit is discovered, the Unit Select switch on the temporary base unit should be set to Base.

Note: If you do not reassign the temporary base unit as the new base unit, and the temporary base unit fails, the next unit directly downstream from this unit becomes the new temporary base unit. This process can continue until there are only two units left in the stack configuration.

For detailed information about temporary base units, see *Installing the BayStack 400-ST1 Cascade Module*.

Temporary base unit

In a mixed stack containing only one Business Policy Switch

If there is only one Business Policy Switch in your mixed stack configuration and it fails, the next upstream BayStack 410 *or* BayStack 450 switch from the failed base unit will become the temporary base unit and will continue stack operation. The base unit change is indicated by the base LED on the temporary base unit's LED display panel turning on (amber).

If the stack's base unit reverts to a BayStack 410 *or* BayStack 450 switch, the stack does not maintain Business Policy Switch features and will continue operation as a BayStack 410 or BayStack 450 stack.

In a mixed stack containing more than one Business Policy Switch

If the assigned Business Policy Switch base unit fails, the next *Business Policy Switch* unit in the stack order automatically becomes the new temporary base unit. All Business Policy Switch units in the stack will be exhausted as base units, successively, before assigning a BayStack 410 *or* BayStack 450 as base unit. The base unit change is indicated by the base LED on the temporary base unit's LED display panel turning on (amber).

If the stack's base unit reverts to a BayStack 410 *or* BayStack 450 switch, the stack does not maintain Business Policy Switch features and will continue operation as a BayStack 410 or BayStack 450 stack.

Compatible software versions

Be sure to follow the instructions for the initial setup according to the *Installing the Business Policy Switch 2000* guide.

In a mixed stack, the BayStack 450 and BayStack 410 switches must use compatible, but device specific, software versions to operate with the Business Policy Switch. You *must* ensure that the Interoperability Software Version Numbers (ISVN) are identical. That is, the ISVN number for the BayStack 450 switch and BayStack 410 switch must have the same ISVN as the Business Policy Switch. If they are not the same, the stack does not operate.

You can verify the software version and the ISVN in the sysDescr field (see Figure 105) in the System Characteristics screen.

Figure 105 System Characteristics screen

```
                          System Characteristics

Operation Mode:    Stack, Unit # 1
Size Of Stack:     2
Base Unit:         1

MAC Address:       00-80-2C-8D-23-DF

Reset Count:       16
Last Reset Type:   Management Reset
Power Status:      Primary Power
Local MDA Type:    None
sysDescr:          BPS2000 HW:AB3 FW:Vx.x SW:v1.0.x.x ISVN: 1
sysObjectID:       1.3.6.1.4.1.45.3.40.1
sysUpTime:         0 days, 0:11:3
sysServices:       3
sysContact:        [  ]

sysName:           [  ]

sysLocation:       [  ]


Enter text, press <Return> or <Enter> when complete.
Press Ctrl-R to return to previous menu.  Press Ctrl-C to return to Main Menu.
```

Refer to "Software Download screen" on page 219 for software downloading information.

Using cascade modules

Installation instructions are provided with each BayStack 400-ST1 Cascade Module (see *Installing the BayStack 400-ST1 Cascade Module*). The BayStack 400-ST1 Cascade Module *does not operate* with BayStack 450 or BayStack 410 switches that are configured with BayStack 450 software versions *earlier than* version V1.1.0.

For information about using MDAs, refer to Appendix D, "Media dependent adapters," on page 261.

Using the console interface

Console/Comm port

In order to use all the Business Policy Switch management features (for example, downloading software), you must connect your console terminal into a Business Policy Switch port within your mixed stack.

For more information about the console/comm port, see “Console port” on page 30.

Troubleshooting problems

If you suspect problems with a newly installed mixed stack configuration, start troubleshooting by verifying the following items:

- A Business Policy Switch is designated as the base unit.
- All other units in the stack have the base unit select switch set to Off.
- The Business Policy Switch’s operational mode is set to Hybrid Stack, and the unit has been reset after changing the operational mode (Figure 104).
- All units in the stack exhibit the same ISVN.
- All units must be reset when you add a Business Policy Switch to an existing BayStack 450 and 410 switch stack.
- All Business Policy Switches have the same software version. Similarly, all BayStack 450 and BayStack 410 switches are operating with updated and compatible software.
- When the stack is powered up, ensure that the Cas Up and Cas Dwn (cascade) and Base LEDs are green (steady, not blinking).

Appendix C
Gigabit fiber optical characteristics

The Uplink/Expansion Module on the Business Policy Switch 2000 supports 1000BASE-X (Gigabit Ethernet) MDAs. This appendix describes the optical characteristics of the 1000BASE-X MDAs. See Appendix D, "Media dependent adapters," for more information about MDAs.

1000BASE-SX models

The 450-1SX and 450-1SR MDAs provide 1000BASE-SX (850 nanometers, short wavelength, Gigabit Ethernet) connectivity. The 450-1SX provides one 1000BASE-SX port. The 450-1SR provides one 1000BASE-SX port and one LinkSafe redundant port.

Operating range

Table 58 lists the operating range for the 1000BASE-SX models.

Table 58 Operating range for 1000BASE-SX

Fiber type	Modal bandwidth @ 850 nanometers with minimum overfilled launch (MHz · Km)	Minimum range (meters)
62.5 um MMF	160	2 to 220
62.5 um MMF	200	2 to 275
50 um MMF	400	2 to 500
50 um MMF	500	2 to 550
10 um MMF	Not supported	Not supported

Transmit characteristics

Table 59 lists the transmit characteristics for the 1000BASE-SX models.

Table 59 1000BASE-SX transmit characteristics

Description	62.5 micron multimode fiber	50 micron multimode fiber	Unit
Transmitter type	Shortwave laser	Shortwave laser	
Signaling speed	1.25 ± 100 ppm	1.25 ± 100 ppm	GBd
Wavelength (l, range)	770 to 860	770 to 860	nm
T rise/T fall (maximum; 20% - 80%; > 830 nm)	0.26	0.26	ns
T rise/T fall (maximum; 20% - 80%; < = 830 nm)	0.21	0.21	ns
RMS spectral width (maximum)	0.85	0.85	nm
Average launch power (maximum)*	See footnote 1	See footnote 1	dBm
Average launch power (minimum)	– 9.5	– 9.5	dBm
Average launch power of OFF transmitter (maximum)†	– 30	– 30	dBm
Extinction ratio (minimum)	9	9	dB
RIN (maximum)	– 117	– 117	dB/Hz
Coupled Power Ratio (CPR) minimum ‡	9 < CPR	9 < CPR	db

* The 1000BASE-SX launch power shall be the lesser of the class 1 safety limit, as defined by the IEEE 802.3z standard, Clause 38.7.2, or the average receive power (maximum), as defined in Table 60.

† Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a “transmit disable” or other optional laser shutdown conditions. During all conditions when the PMA is powered, the AC signal (data) into the transmit port will be valid encoded 8B/10B patterns (this is a requirement of the PCS layers), except for short durations during system power-on-reset or diagnostics when the PMA is placed in a loopback mode.

‡ Avoid radial overfilled launches even if the launch parameters are within the CPR range.

Receive characteristics

Table 60 lists the receive characteristics for the 1000BASE-SX models.

Table 60 1000BASE-SX receive characteristics

Description	62.5 micron multimode fiber	50 micron multimode fiber	Unit
Signaling Speed (range)	1.25 ± 100 ppm	1.25 ± 100 ppm	GBd
Wavelength (range)	770 to 860	770 to 860	nm
Average receive power (maximum)	0	0	dBm
Receive sensitivity	– 17	– 17	dBm
Return loss (minimum)	12	12	dB
Stressed receive sensitivity *, †	– 12.5	– 13.5	dBm
Receive electrical 3 dB upper cutoff frequency (maximum)	1500	1500	MHz
Vertical eye-closure penalty ‡	2.60	2.20	dB

* Measured with conformance test signal at TP3 for BER = 10^{-12} at the eye center.

† Measured with a transmit signal having a 9 dB extinction ratio. If you use another extinction ratio, correct the stressed receive sensitivity according to the extinction ratio penalty.

‡ Vertical eye-closure penalty is a test condition for measuring stressed receive sensitivity. It is not a required characteristic of the receiver.

Worst-case power budget and penalties

Table 61 lists the worst-case power budget and penalties for the 1000BASE-SX models.

Note: The link power penalties (Table 61) are used for link power budget calculations only. They are not requirements and are not meant to be tested.

Table 61 Worst-case 1000BASE-SX power budget and penalties

Parameter	62.5 micron multimode fiber		50 micron multimode fiber		Unit
Modal bandwidth as measured at 850 nm (minimum, overfilled launch)	160	200	400	500	MHz · km
Link power budget	7.5	7.5	7.5	7.5	dB
Operating distance	220	275	500	550	m
Channel insertion loss *, †	2.38	2.60	3.37	3.56	dB
Link power penalties	4.27	4.29	4.07	3.57	dB
Unallocated margin in link power budget	0.84	0.60	0.05	0.37	dB

* Operating distances used to calculate the channel insertion loss are the maximum values specified in Table 58 on page 253.

† A wavelength of 830 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

1000BASE-LX models

The 450-1LX and 450-1LR MDAs provide 1000BASE-LX (1300 nanometers, long wavelength, Gigabit Ethernet) connectivity. The 450-1LX provides one 1000BASE-LX port. The 450-1LR provides one 1000BASE-LX port and one LinkSafe™ redundant port.

Operating range

Table 62 lists the operating range for the 1000BASE-LX models.

Table 62 Operating range for 1000BASE-LX

Fiber type	Modal bandwidth @ 1300 nanometers with minimum overfilled launch (MHz · km)	Minimum range (meters)
62.5 um MMF	500	2 to 550
50 um MMF	400	2 to 550
50 um MMF	500	2 to 550
10 um SMF	N/A	2 to 5000

Transmit characteristics

Table 63 lists the transmit characteristics for the 1000BASE-LX models.

Table 63 1000BASE-LX transmit characteristics

Description	62.5 micron multimode fiber	50 micron multimode fiber	10 micron single-mode fiber	Unit
Transmitter type	Longwave Laser	Longwave Laser	Longwave Laser	
Signaling speed (range)	1.25 ± 100 ppm	1.25 ± 100 ppm	1.25 ± 100 ppm	GBd
Wavelength (range)	1270 to 1355	1270 to 1355	1270 to 1355	nm
T rise /T fall (maximum 20-80% response time)	0.26	0.26	0.26	ns
RMS spectral width (maximum)	4	4	4	nm
Average launch power (maximum)	– 3	– 3	– 3	dBm
Average launch power (minimum)	– 11.5	– 11.5	– 11.0	dBm
Average launch power of OFF transmitter (maximum)	– 30	– 30	– 30	dBm
Extinction ratio (minimum)	9	9	9	dB
RIN (maximum)	– 120	– 120	– 120	dB/Hz
Coupled Power Ratio (CPR)*	28 < CPR < 40	12 < CPR < 20	N/A	dB

* Due to the dual media (single-mode and multimode) support of the LX transmitter, fulfillment of this specification requires a single-mode fiber offset-launch mode-conditioning patch cord described in IEEE 802.3, Clause 38.11.4 for MMF operation. This patch cord is not used for single-mode operation.

Receive characteristics

Table 64 lists the receive characteristics for the 1000BASE-LX models.

Table 64 1000BASE-LX receive characteristics

Description	Value	Unit
Signaling speed (range)	1.25 ± 100 ppm	GBd
Wavelength (range)	1270 to 1355	nm
Average receive power (maximum)	– 3	dBm
Receive sensitivity	– 19	dBm
Return loss (minimum)	12	dB
Stressed receive sensitivity *, †	– 14.4	dBm
Receive electrical 3 dB upper cutoff frequency (maximum)	1500	MHz
Vertical eye-closure penalty ‡	2.60	dB

* Measured with conformance test signal at TP3 (see IEEE 802.3, Clause 38.6.11) for BER = 10^{-12} at the eye center.

† Measured with a transmit signal having a 9 dB extinction ratio. If another extinction ratio is used, the stressed receive sensitivity should be corrected for the extinction ratio penalty.

‡ Vertical eye-closure penalty is a test condition for measuring stressed receive sensitivity. It is not a required characteristic of the receiver.

Worst-case power budget and penalties

Table 65 lists the worst-case power budget and penalties for the 1000BASE-LX models.

Note: The link power penalties (Table 65) are used for link power budget calculations only. They are not requirements and are not meant to be tested.

Table 65 Worst-case 1000BASE-LX power budget and penalties

Parameter	62.5 micron multimode fiber	50 micron multimode fiber		10 micron single-mode fiber	Unit
Modal bandwidth as measured at 1300 nm (minimum, overfilled launch)	500	400	500	N/A	MHz · km
Link power budget	7.5	7.5	7.5	8.0	dB
Operating distance	550	550	550	5000	m
Channel insertion loss	2.35	2.35	2.35	4.57	dB
Link power penalties	3.48	5.08	3.96	3.27	dB
Unallocated margin in link power budget	1.67	0.07	1.19	0.16	dB

Appendix D
Media dependent adapters

This appendix describes the optional media dependent adapters (MDAs) that are available from Nortel Networks. The MDAs can support high-speed connections to servers, shared Fast Ethernet hubs, or backbone devices.

Note: The MDAs are *not* hot-swappable. Power down the switch before installing or removing an MDA.

Table 66 describes available MDA models.

Table 66 MDA models

Interface type	Model	Refer to:
1000BASE-SX (Shortwave gigabit fiber)	450-1SR MDA 450-1SX MDA	page 262
1000BASE-LX (Longwave gigabit fiber)	450-1LR MDA 450-1LX MDA	page 264
10BASE-T/100BASE-TX (UTP)	BPS2000-4TX MDA	page 267
100BASE-FX (Multimode fiber)	BPS2000-2FX MDA BPS2000-4FX MDA	page 269

Nortel Networks is constantly adding new models and features to existing product lines; for a full range of MDAs that are available from Nortel Networks, see your Nortel Networks sales representative.

1000BASE-SX: 450-1SR MDA and 450-1SX MDA

Warning: This is a Class 1 Laser/LED product. It contains a laser light source that can injure your eyes. Never look into an optical fiber or connector port. Always assume that the fiber optic cable or connector is connected to a laser light source.

Vorsicht: Dieses Laser/LED-Produkt der Klasse 1 enthält eine Laserlichtquelle, die zu Augenverletzungen führen kann. Sehen Sie nie in einen Lichtwellenleiter oder Glasfaserstecker-Port. Gehen Sie immer davon aus, daß das Glasfaserkabel oder der Glasfaserstecker an eine Laserlichtquelle angeschlossen ist.

Avertissement: Ceci est un appareil Laser/DEL de Classe 1. Cet appareil contient une source lumineuse à rayons laser dangereuse pour les yeux. Ne regardez jamais directement une fibre optique ou un port de connexion. Agissez toujours comme si le câble de fibres optiques ou le connecteur était relié à une source lumineuse à rayons laser.

Advertencia: Éste es un producto láser/LED de Clase 1. Contiene una fuente de luz láser que puede causar lesiones en los ojos. Nunca mire dentro de un cable o de un puerto de conexión de fibra óptica. Asuma siempre que el cable o el connector de fibra óptica está conectado a una fuerte de luz láser.

Avvertenza: Questo è un produtto laser/LED di Classe 1 e contiene una sorgente luminosa a laser che può danneggiare gli occhi. Non guardare mai all'interno di una port a fibra ottica o di una porta connettore. Dare sempre per scontato che il cavo di fibra ottica o il connettore siano collegati ad una sorgente luminosa a laser.

警告：光ファイバ装置は目に有害なレーザー光や赤外線を放射することがあります。光ファイバやコネクタ・ポートを覗き込まないでください。光ファイバ・ケーブルは光源に接続されているものと思ってください。

There are two 1000BASE-SX (shortwave gigabit) MDA models:

- The 450-1SR MDA is a single MAC MDA with a separate redundant Phy (backup Phy port). Only one Phy port can be active at any time. If the active Phy port fails, the redundant Phy port automatically becomes the active port.
- The 450-1SX MDA is a single Phy MDA.

Both models (Figure 106) conform to the IEEE 802.3z 1000BASE-SX standard and use shortwave 850 nm fiber optic connectors to connect devices over multimode (550 meter) fiber optic cable.

Figure 106 1000BASE-SX MDA front panels

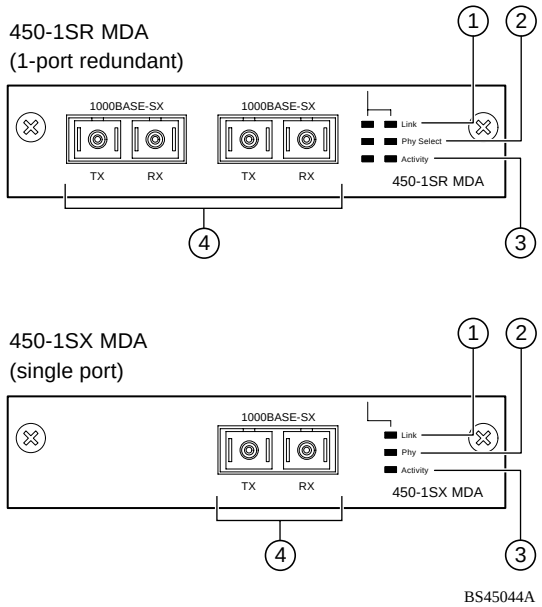


Table 67 describes the 1000BASE-SX components and LEDs.

For installation instructions, see "Installing an MDA" on page 271.

Table 67 1000BASE-SX MDA components

Item	Label	Description
1	Link	Communication link LEDs (green): On: Valid communications link. Off: The link connection is bad or there is no connection to this port. Blinking: The corresponding port is management disabled.
2	Phy (or) Phy Select	Phy status LEDs (green): On: The corresponding Phy port is active. Off: The corresponding Phy port is in backup mode or there is no connection to this port.
3	Activity	Port activity LEDs (green): Blinking: Indicates network activity level for the corresponding port. A high level of network activity can cause LEDs to appear to be on continuously.
4		1000BASE-X SC port connectors.

1000BASE-LX: 450-1LR MDA and 450-1LX MDA

Warning: This is a Class 1 Laser/LED product. It contains a laser light source that can injure your eyes. Never look into an optical fiber or connector port. Always assume that the fiber optic cable or connector is connected to a laser light source.

Vorsicht: Dieses Laser/LED-Produkt der Klasse 1 enthält eine Laserlichtquelle, die zu Augenverletzungen führen kann. Sehen Sie nie in einen Lichtwellenleiter oder Glasfaserstecker-Port. Gehen Sie immer davon aus, daß das Glasfaserkabel oder der Glasfaserstecker an eine Laserlichtquelle angeschlossen ist.

Avertissement: Ceci est un appareil Laser/DEL de Classe 1. Cet appareil contient une source lumineuse à rayons laser dangereuse pour les yeux. Ne regardez jamais directement une fibre optique ou un port de connexion. Agissez toujours comme si le câble de fibres optiques ou le connecteur était relié à une source lumineuse à rayons laser.

Advertencia: Éste es un producto láser/LED de Clase 1. Contiene una fuente de luz láser que puede causar lesiones en los ojos. Nunca mire dentro de un cable o de un puerto de conexión de fibra óptica. Asuma siempre que el cable o el connector de fibra óptica está conectado a una fuerte de luz láser.

Avvertenza: Questo è un produtto laser/LED di Classe 1 e contiene una sorgente luminosa a laser che può danneggiare gli occhi. Non guardare mai all'interno di una port a fibra ottica o di una porta connettore. Dare sempre per scontato che il cavo di fibra ottica o il connettore siano collegati ad una sorgente luminosa a laser.

警告: これはクラス1レーザー/LED製品です。目に障害を与える恐れのあるレーザー光源が含まれています。光ファイバおよびコネクタ・ポートは、のぞき込まないようにしてください。光ファイバ・ケーブルまたはコネクタは、常にレーザー光源に接続されているものと想定してください。

There are two 1000BASE-LX (longwave gigabit) MDA models:

- The 450-1LR MDA is a single MAC MDA with a separate redundant Phy (backup Phy port). Only one Phy port can be active at any time. If the active Phy port fails, the redundant Phy port automatically becomes the active port.
- The 450-1LX MDA is a single Phy MDA.

Both models (Figure 107) conform to the IEEE 802.3z 1000BASE-LX standard and use longwave 1300 nm fiber optic connectors to connect devices over single mode (3 kilometer) or multimode (550 meters) fiber optic cable.

Note: The optical performance of this transceiver cannot be guaranteed when connected to a multimode fiber plant without the use of the special offset SMF/MMF mode conditioning patch cord (see "1000BASE-LX multimode applications" on page 274).

Figure 107 1000BASE-LX MDA front panels

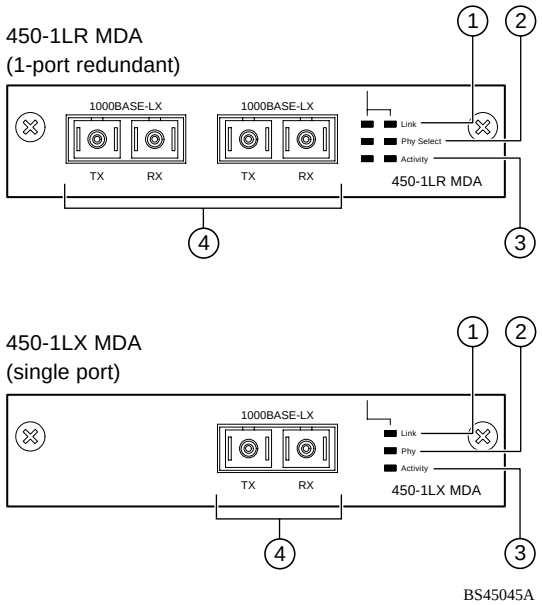


Table 68 describes the 1000BASE-LX MDA components and LEDs.

For installation instructions, see “Installing an MDA” on page 271.

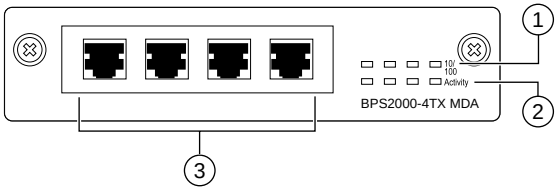
Table 68 1000BASE-LX MDA components

Item	Label	Description
1	Link	Communication link LEDs (green): On: Valid communications link. Off: The communications link connection is bad or there is no connection to this port. Blinking: The corresponding port is management disabled.
2	Phy (or) Phy Select	Phy status LEDs (green): On: The corresponding Phy port is active. Off: The corresponding Phy port is in backup mode or there is no connection to this port.
3	Activity	Port activity LEDs (green): Blinking: Indicates network activity level for the corresponding port. A high level of network activity can cause LEDs to appear to be on continuously.
4		1000BASE-X SC port connectors.

10BASE-T/100BASE-TX: BPS2000-4TX MDA

The BPS2000-4TX MDA (Figure 108) uses four 10BASE-T/100BASE-TX RJ-45 (8-pin modular) port connectors to attach Ethernet devices. Table 68 describes the BPS2000-4TX MDA components and LEDs.

Figure 108 BPS2000-4TX MDA front panel



The RJ-45 ports are configured as media-dependent interface-crossover (MDI-X) connectors. These ports connect over straight cables to the network interface card (NIC) in a node or server, similar to a conventional Ethernet repeater hub. If you are connecting to another Ethernet hub or switch, use a crossover cable unless an MDI connection exists on the associated port of the attached device.

The BPS2000-4TX MDA can operate at either 10 Mb/s or 100 Mb/s. The speed is determined through autonegotiation with its connecting device.

For installation instructions, see “Installing an MDA” on page 271.

100BASE-FX: BPS2000-2FX MDA and BPS2000-4FX MDA

Warning: Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

Vorsicht: Glasfaserkomponenten können Laserlicht bzw. Infrarotlicht abstrahlen, wodurch Ihre Augen geschädigt werden können. Schauen Sie niemals in einen Glasfaser-LWL oder ein Anschlußteil. Gehen Sie stets davon aus, daß das Glasfaserkabel an eine Lichtquelle angeschlossen ist.

Avertissement: L'équipement à fibre optique peut émettre des rayons laser ou infrarouges qui risquent d'entraîner des lésions oculaires. Ne jamais regarder dans le port d'un connecteur ou d'un câble à fibre optique. Toujours supposer que les câbles à fibre optique sont raccordés à une source lumineuse.

Advertencia: Los equipos de fibra óptica pueden emitir radiaciones de láser o infrarrojas que pueden dañar los ojos. No mire nunca en el interior de una fibra óptica ni de un puerto de conexión. Suponga siempre que los cables de fibra óptica están conectados a una fuente luminosa.

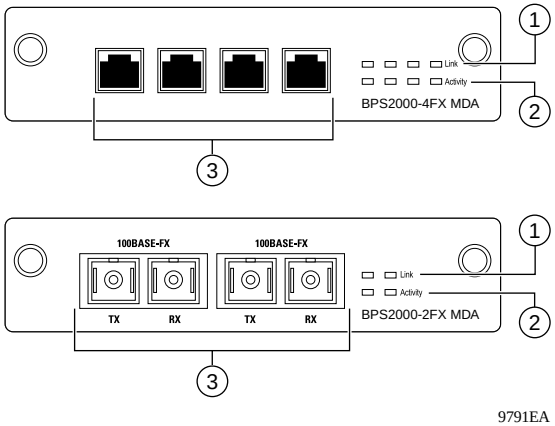
Avvertenza: Le apparecchiature a fibre ottiche emettono raggi laser o infrarossi che possono risultare dannosi per gli occhi. Non guardare mai direttamente le fibre ottiche o le porte di collegamento. Tenere in considerazione il fatto che i cavi a fibre ottiche sono collegati a una sorgente luminosa.

警告：光ファイバ装置は目に有害なレーザー光や赤外線を放射することがあります。光ファイバやコネクタ・ポートを覗き込まないでください。光ファイバ・ケーブルは光源に接続されているものと思ってください。

There are two 100BASE-FX models (Figure 109):

- The BPS2000-2FX MDA uses two longwave 1300 nm SC connectors to attach devices over 62.5/125 or 50/125 micron multimode fiber optic cable.
- The BPS2000-4FX MDA uses four longwave 1300 nm MT-RJ connectors to attach devices over 62.5/125 or 50/125 micron multimode fiber optic cable.

Figure 109 100BASE-FX MDA front panels



Both models conform to the IEEE 802.3u 100BASE-FX standard and can be used for fiber-based 100 Mb/s connections (2 km maximum distance) to other compatible Fast Ethernet devices. Single-mode fiber cable is not supported.

Table 69 describes the 100BASE-FX components and LEDs.

For installation instructions, see “Installing an MDA” on page 271.

Table 69 100BASE-FX MDA components

Item	Label	Description
1	Link	LINK status LED (green) On: Indicates 100 Mb/s LINK activity. Off: Indicates no LINK activity.
2	Activity	Activity LED (green) On: Indicates active traffic: Receiving or transmitting. A high level of network activity can cause LEDs to appear to be on continuously. Off: Indicates no active traffic.
3		100BASE-FX port connectors: • BPS2000-2FX uses SC connectors. • BPS2000-4FX uses MT-RJ connectors.

Installing an MDA

The Uplink/Expansion Module slot on the Business Policy Switch accommodates a single MDA. The connection can be either an RJ-45 10/100BASE-TX MDA or a fiber (100BASE-FX or 1000BASE-SX/LX) MDA with an SC or MT-RJ connector.

Note: The MDAs are *not* hot-swappable. Power down the switch before installing or removing an MDA.

To install an MDA into the Uplink/Expansion Module slot:

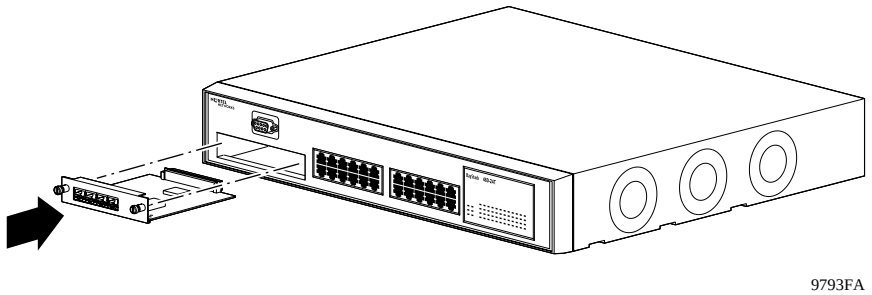
1. Unplug the AC power cord from the back of the switch.
2. Loosen the thumb screws and remove the filler panel (or previously installed MDA) from the Uplink/Expansion Module slot.

Note: If you are replacing an installed MDA with another type of MDA, see “Replacing an MDA with a different model” on page 273.

3 Insert the MDA into the Uplink/Expansion Module card guides (Figure 110).

Make sure the MDA slides in on the card guides. Failure to align the MDA to the card guides could damage the pins.

Figure 110 Installing an MDA



4 Press the MDA *firmly* into the Uplink/Expansion Module slot.

Be sure that the MDA is fully seated into the mating connector.

5 Secure the MDA by tightening the thumb screws on the MDA front panel.

6 Attach devices to the MDA ports.

After connecting the port cables, continue to follow the instructions in the manual for the switch to connect power and verify the installation.

Note: The IEEE 802.3u specification requires that all ports operating at 100 Mb/s use only Category 5 unshielded twisted pair (UTP) cabling.

Replacing an MDA with a different model

When replacing an installed MDA with another type of MDA, complete the following steps to clear the switch NVRAM:

1. Power down the switch.

   Remove the AC power cord from the power source.

2. Remove the installed MDA.

   Loosen the thumbscrews and remove the MDA.

3. Cycle the switch power.

   Power up the switch and wait for the Nortel Networks logo screen to appear (approximately 10 seconds); then power down the switch.

4. Install the replacement MDA.

   Be sure to *firmly* tighten the two thumbscrews on the MDA front panel.

5. Power up the switch.

1000BASE-LX multimode applications

For 1000BASE-LX multimode applications, the longwave gigabit transceivers must be mode conditioned *externally* via a special offset SMF/MMF patch cord. The offset SMF/MMF patch cord allows the same transceiver to be used for both multimode and single-mode fiber. See your Nortel Networks sales representative for more information about the SMF/MMF patch cord.

The 1000BASE-LX transceiver is designed to mechanically accommodate the *single-mode ferrules* used on one end of the special offset SMF/MMF patch cord. *Multimode ferrules* must not be used because they can bind and cause damage to the transceiver.

Do not connect multimode cables *directly* into the 1000BASE-LX MDA transceiver. Instead, connect a special offset SMF/MMF patch cord into the transceiver, and then connect the multimode cable into the SMF/MMF patch cord.

For more information about gigabit transmission over fiber optic cable and mode conditioning, refer to the following publication: *Reference Note: Gigabit Ethernet Physical Layer Considerations* (Part number 201540-B). This publication is available at the *support.baynetworks.com/library/tpubs/* URL.

Appendix E
Quick steps to features

If you are a system administrator with experience configuring Business Policy Switch 2000 VLANs, MultiLink Trunking, Port Mirroring, and IGMP Snooping, use the flowcharts on the following pages as quick configuration guides. The flowcharts refer you to the “configuration rules” appropriate for each feature.

The flowcharts cover the following features:

- 802.1Q VLANs (page 275)
- MultiLink Trunking (page 279)
- Port Mirroring (page 280)
- IGMP Snooping (page 281)

Configuring 802.1Q VLANs

To create or modify an 802.1Q VLAN, follow the flowcharts in Figure 111, Figure 112, and Figure 113.

To open the VLAN Configuration screen:

➨ Choose VLAN Configuration (or press v) from the VLAN Configuration Menu screen.

Figure 111 Configuring 802.1Q VLANs (1 of 3)

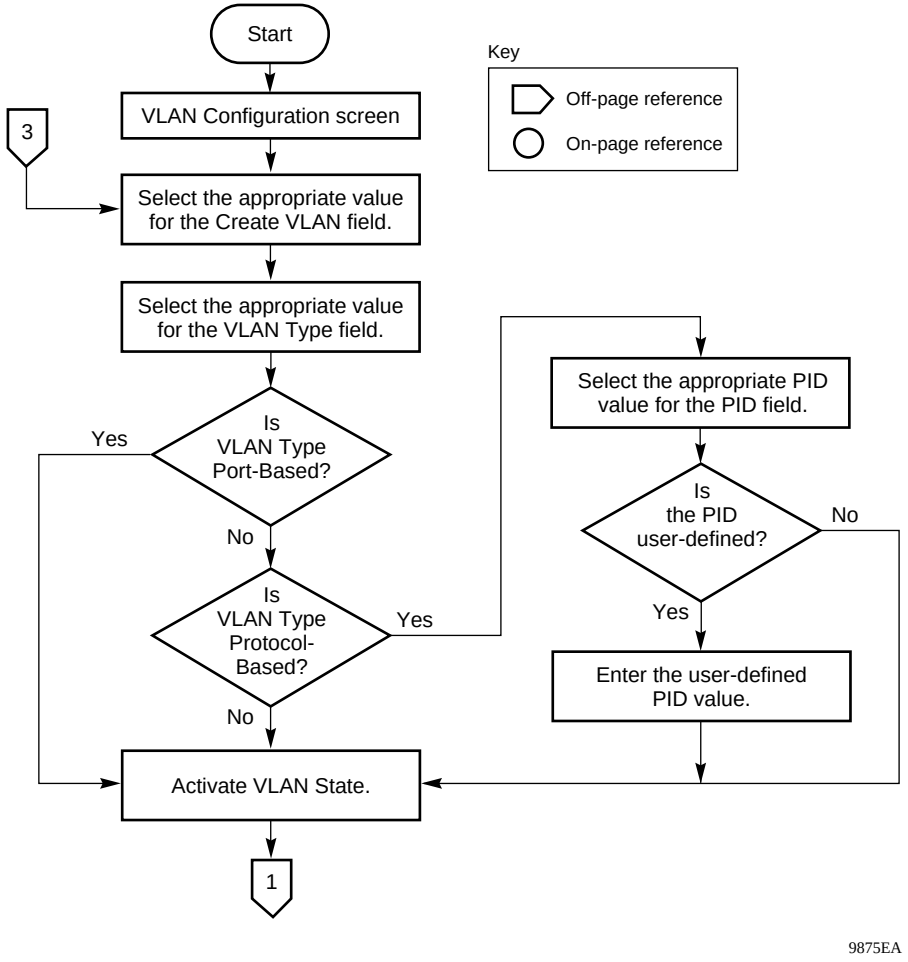


Figure 112 Configuring 802.1Q VLANs (2 of 3)

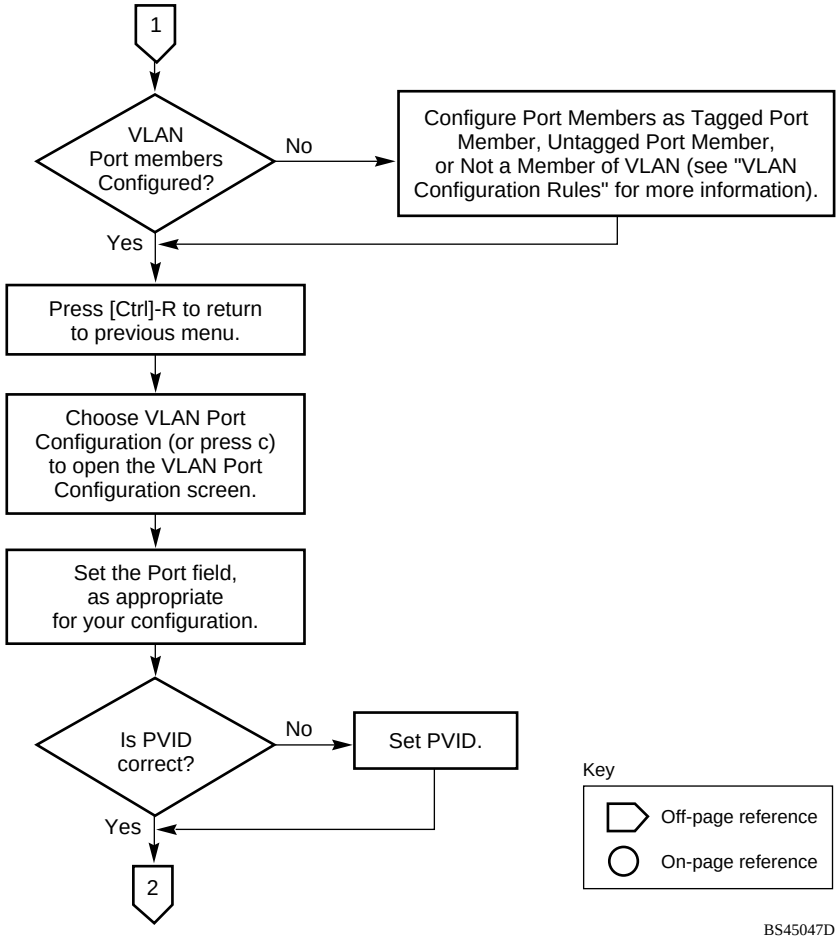
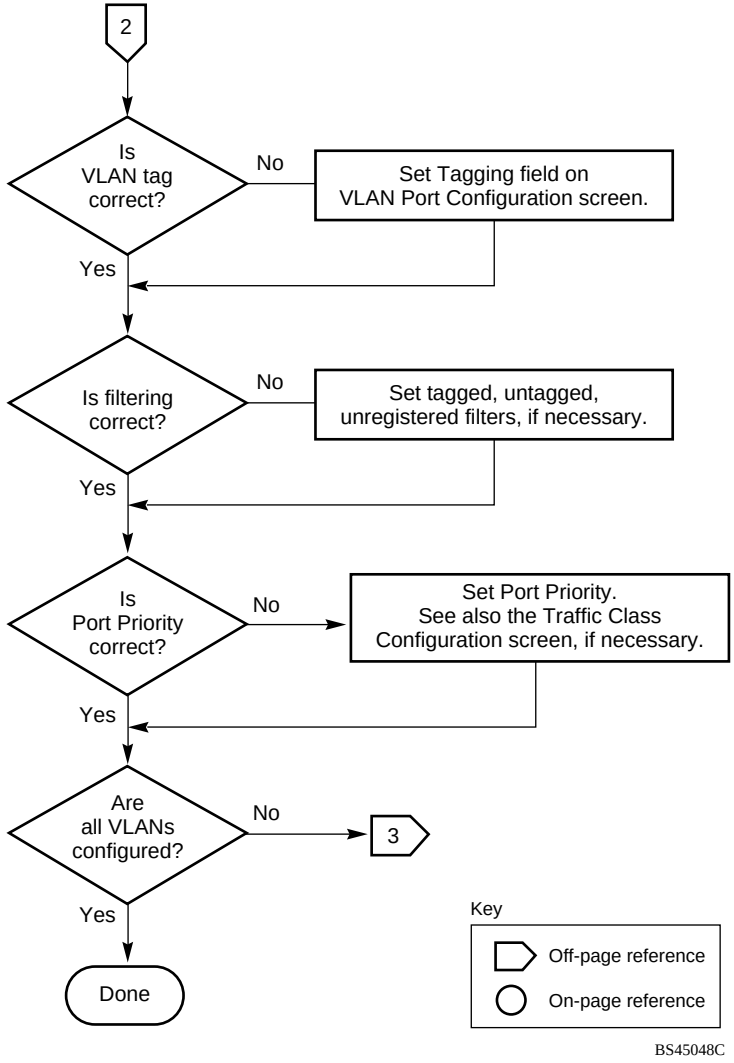

1
VLAN Port members Configured?
No
Configure Port Members as Tagged Port Member, Untagged Port Member, or Not a Member of VLAN (see "VLAN Configuration Rules" for more information).
Yes
Press [Ctrl]-R to return to previous menu.
Choose VLAN Port Configuration (or press c) to open the VLAN Port Configuration screen.
Set the Port field, as appropriate for your configuration.
Is PVID correct?
No
Set PVID.
Yes
2
Key
Off-page reference
On-page reference
BS45047D

Figure 113 Configuring 802.1Q VLANs (3 of 3)



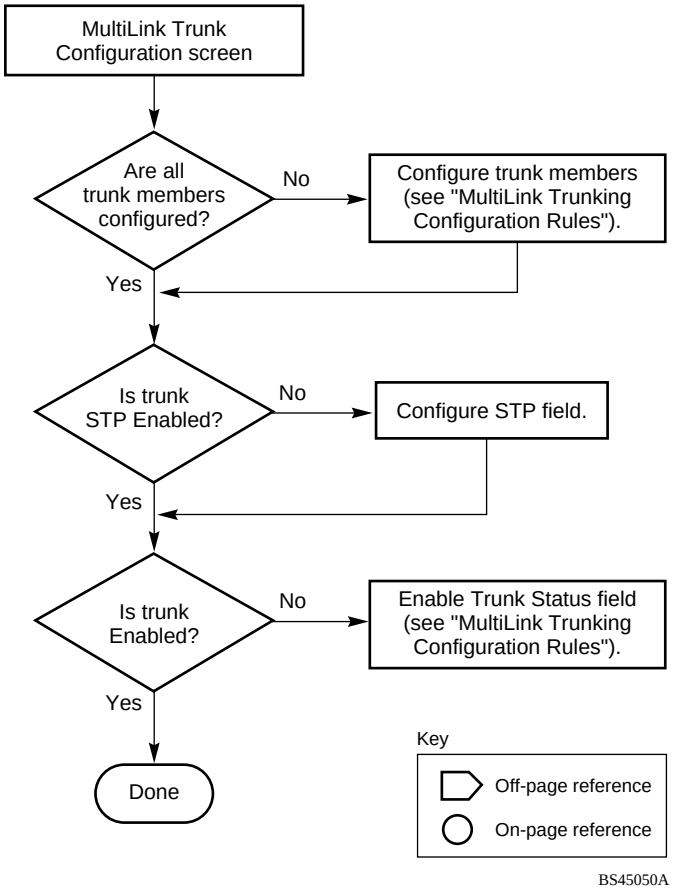
Configuring MultiLink Trunks

To create or modify a MultiLink Trunk, follow the flowchart in Figure 114.

To open the MultiLink Trunk Configuration screen:

➨ Choose MultiLink Trunk Configuration (or press t) from the MultiLink Trunk Configuration Menu screen

Figure 114 Configuring MultiLink Trunks



Configuring Port Mirroring

To create or modify port-mirroring ports, follow the flowcharts in Figure 115 and Figure 116).

To open the Port Mirroring Configuration screen:

➨ Choose Port Mirroring Configuration (or press i) from the Switch Configuration Menu screen

Figure 115 Configuring Port Mirroring (1 of 2)

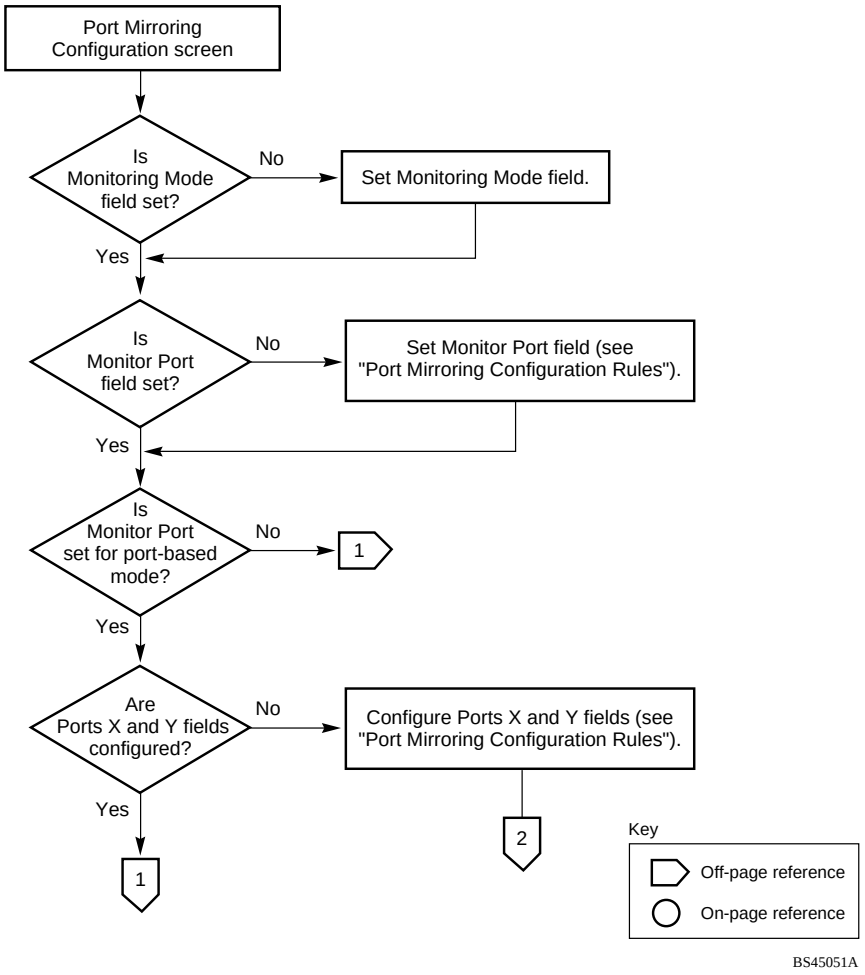
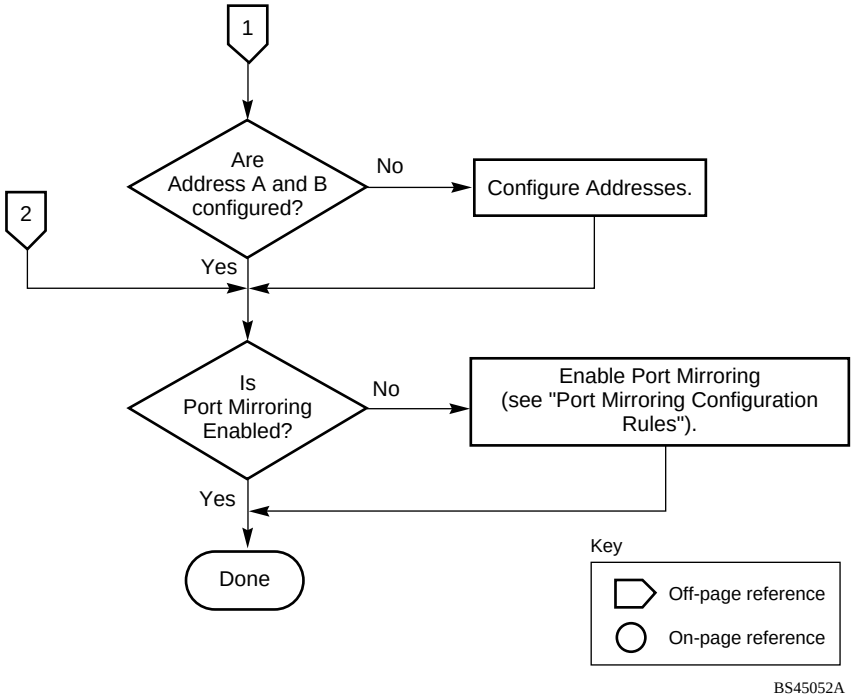


Figure 116 Configuring Port Mirroring (2 of 2)



Configuring IGMP Snooping

To create or modify IGMP Snooping ports, follow the flowcharts in Figures Figure 117 to Figure 119.

To open the IGMP Configuration screen:

➨ Choose IGMP Configuration (or press g) from the Switch Configuration Menu screen.

Figure 117 Configuring IGMP Snooping (1 of 3)

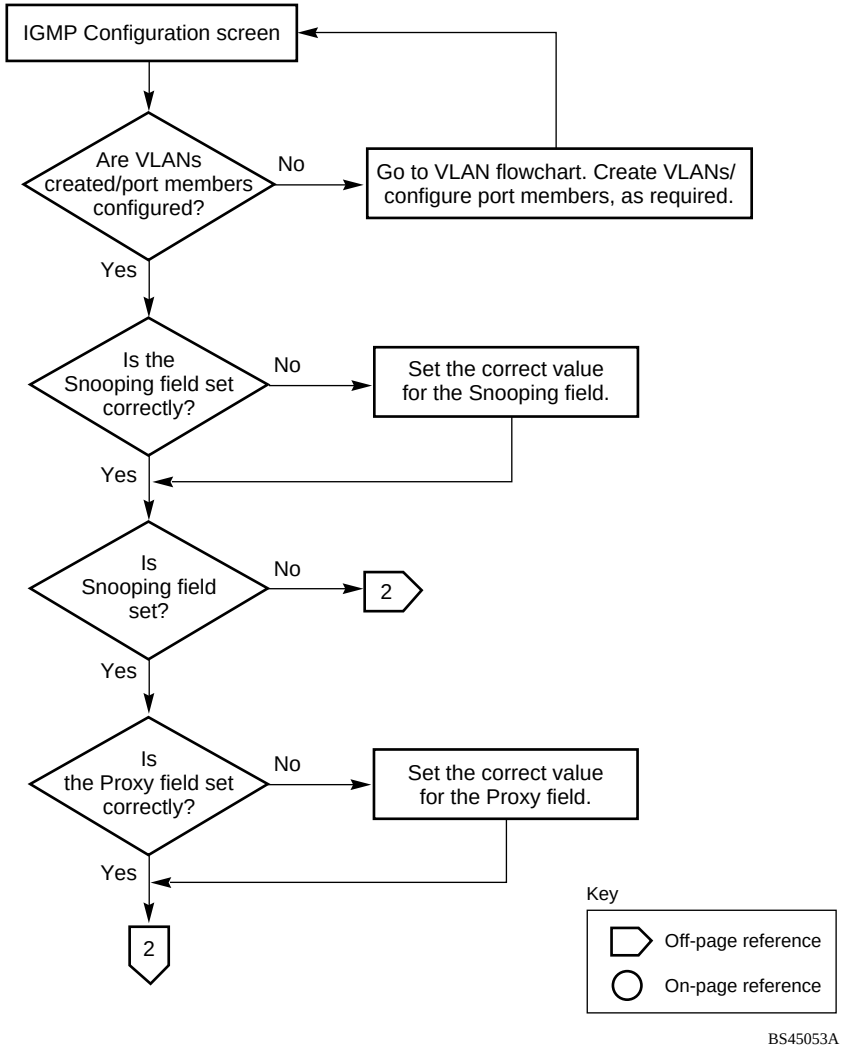


Figure 118 Configuring IGMP Snooping (2 of 3)

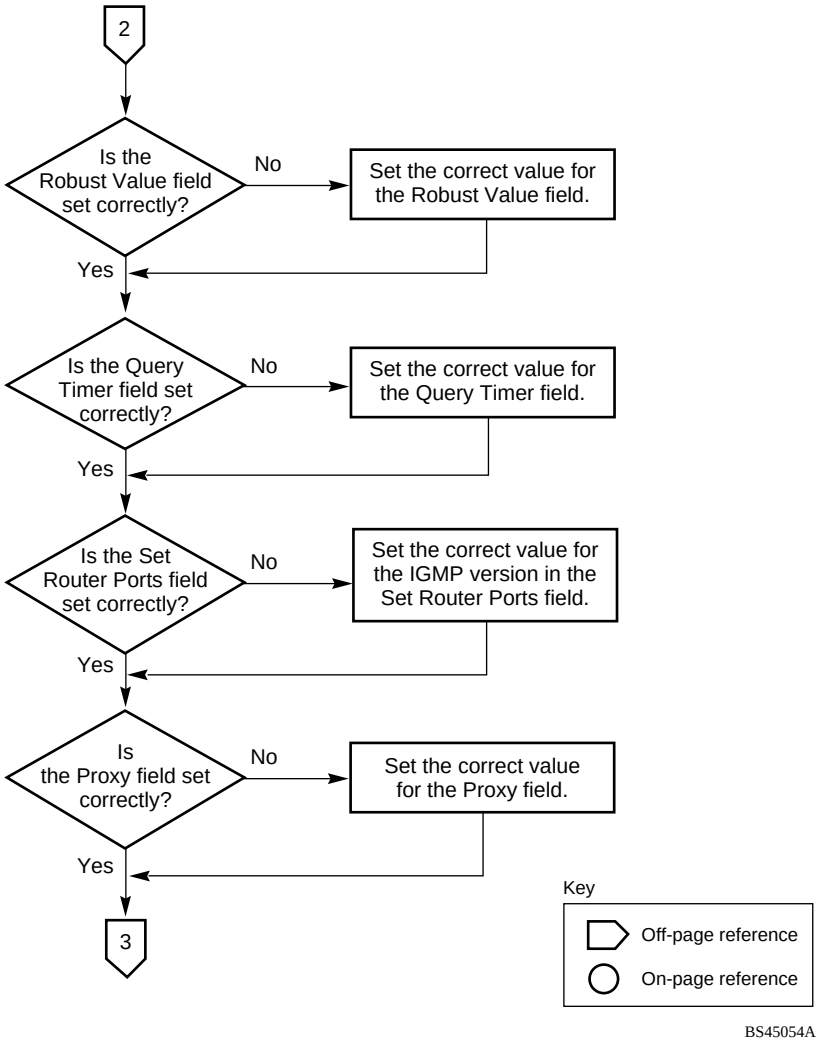
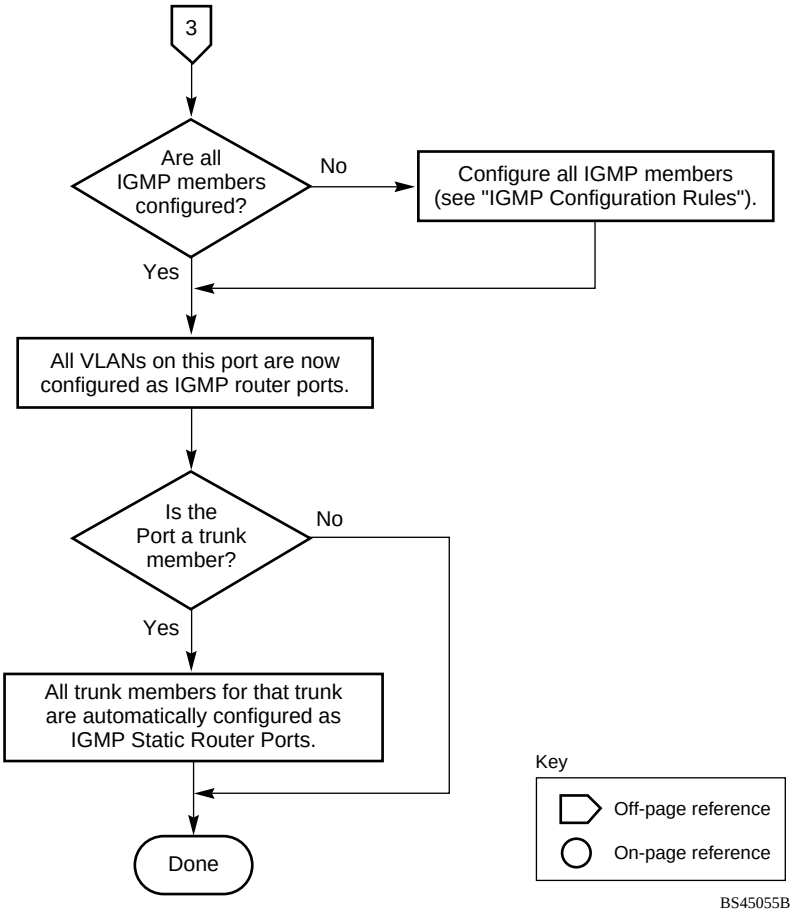


Figure 119 Configuring IGMP Snooping (3 of 3)



Appendix F
Connectors and pin assignments

This appendix describes the Business Policy Switch 2000 port connectors and pin assignments.

RJ-45 (10BASE-T/100BASE-TX) port connectors

The RJ-45 port connectors (Figure 120) are wired as MDI-X ports to connect end stations without using crossover cables. (See “MDI and MDI-X devices” on page 286 for information about MDI-X ports.) For 10BASE-T connections, use Category 3 (or higher) UTP cable. For 100BASE-TX connections, use only Category 5 UTP cable.

Figure 120 RJ-45 (8-Pin Modular) port connector

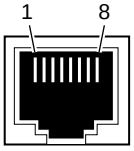


Table 70 lists the RJ-45 (8-pin modular) port connector pin assignments.

Table 70 RJ-45 port connector pin assignments

Pin	Signal	Description
1	RX+	Receive Data +
2	RX-	Receive Data -
3	TX+	Transmit Data +
4	Not applicable	Not applicable
5	Not applicable	Not applicable
6	TX-	Transmit Data -
7	Not applicable	Not applicable
8	Not applicable	Not applicable

MDI and MDI-X devices

Media dependent interface (MDI) is the IEEE standard for the interface to unshielded twisted pair (UTP) cable.

For two devices to communicate, the transmitter of one device must connect to the receiver of the other device. The connection is established through a crossover function, which can be a crossover cable or a port that implements the crossover function internally.

Ports that implement the crossover function internally are known as MDI-X ports, where X refers to the crossover function.

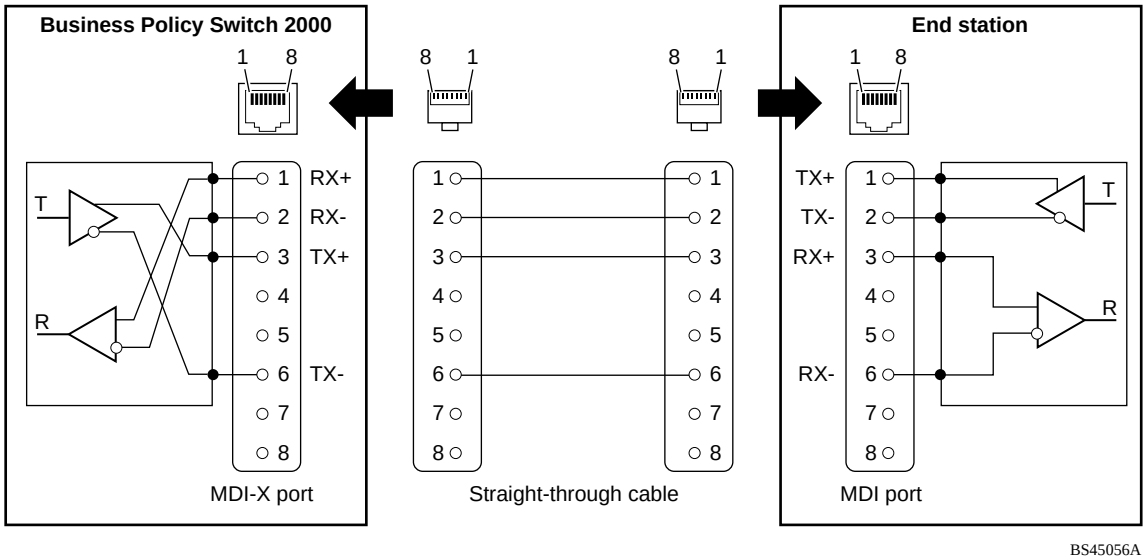
Note: For the transmitter of one device to connect to the receiver of another device, the total number of crossovers must always be an odd number.

The following sections describe the use of straight-through and crossover cables for connecting MDI and MDI-X devices.

MDI-X to MDI cable connections

Business Policy Switch switches use MDI-X ports that allow you to connect directly to end stations without using crossover cables (Figure 121).

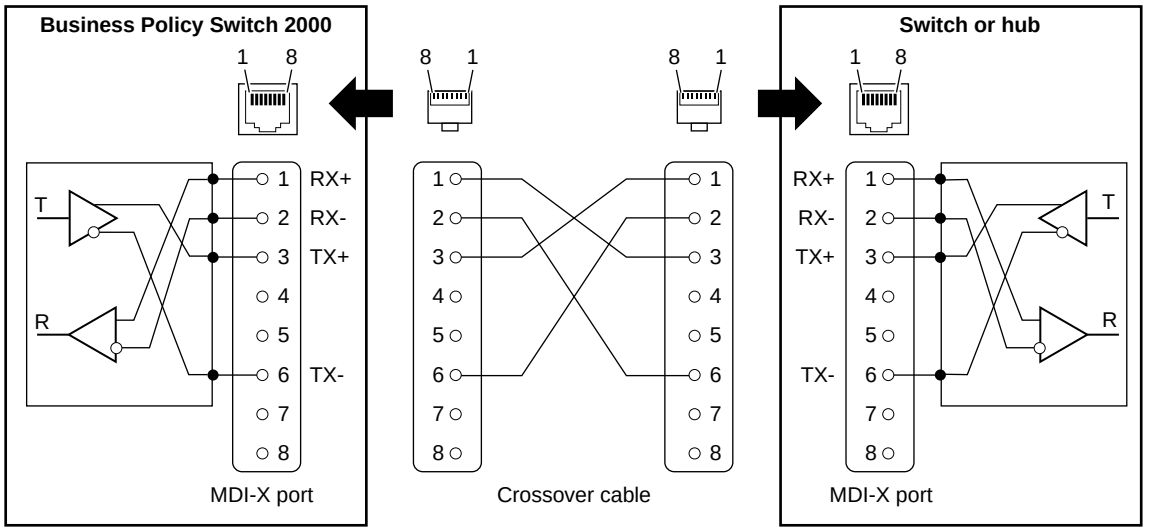
Figure 121 MDI-X to MDI cable connections



MDI-X to MDI-X cable connections

If you are connecting the Business Policy Switch to a device that also implements MDI-X ports, use a crossover cable (Figure 122).

Figure 122 MDI-X to MDI-X cable connections



DB-9 (RS-232-D) Console/Comm Port connector

The DB-9 Console/Comm Port connector (Figure 123) is configured as a data communications equipment (DCE) connector. The DSR and CTS signal outputs are always asserted; the CD, DTR, RTS, and RI signal inputs are not used. This configuration enables a management station (a PC or console terminal) to connect directly to the switch using a straight-through cable.

Figure 123 DB-9 Console port connector

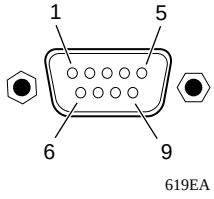


Table 71 lists the DB-9 Console connector pin assignments.

Table 71 DB-9 Console port connector pin assignments

Pin	Signal	Description
1	CD	Carrier detect (not used)
2	TXD	Transmit data (output)
3	RXD	Receive data (input)
4	DTR	Data terminal ready (not used)
5	GND	Signal ground
6	DSR	Not used
7	RTS	Request to send (not used)
8	CTS	Not used
9	RI	Ring indicator (not used)
Shell		Chassis ground

Appendix G
Default Settings

Table 72 lists the factory default settings for the Business Policy Switch 2000 according to the console interface (CI) screens and fields for the settings.

Table 72 Factory default settings

Field	Default setting	Appears in this CI screen
BootP Request Mode	BootP Disabled	“IP Configuration/Setup screen” on page 126
In-Band Stack IP Address	0.0.0.0 (no IP address assigned)	
In-Band Switch IP Address	0.0.0.0 (no IP address assigned)	
In-Band Subnet Mask	0.0.0.0 (no subnet mask assigned)	
Default Gateway	0.0.0.0 (no IP address assigned)	
Read-Only Community String	public	“SNMP Configuration screen” on page 131
Read-Write Community String	private	
Trap IP Address	0.0.0.0 (no IP address assigned)	
Community String	Zero-length string	
Authentication Trap	Enabled	
Link Up/Down Trap	Enabled	
sysContact	Zero-length string	“System Characteristics screen” on page 133
sysName	Zero-length string	
sysLocation	Zero-length string	

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Aging Time	300 seconds	"MAC Address Table screen" on page 138
Find an Address	00-00-00-00-00-00 (no MAC address assigned)	
Port Mirroring Address A:	00-00-00-00-00-00 (no MAC address assigned)	
Port Mirroring Address B:	00-00-00-00-00-00 (no MAC address assigned)	
MAC Address Security	Disabled	"MAC Address Security Configuration Menu screen" on page 141
MAC Address Security SNMP-Locked	Disabled	
Partition Port on Intrusion Detected:	Disabled	
Partition Time	0 seconds (the value 0 indicates forever)	
DA Filtering on Intrusion Detected:	Disabled	
Generate SNMP Trap on Intrusion	Disabled	
Clear by Ports	NONE	
Learn by Ports	NONE	
Current Learning Mode	Not Learning	
Trunk	blank field	"MAC Address Security Port Configuration screen" on page 145
Security	Disabled	
Port List	blank field	"MAC Address Security Port Lists screens" on page 147
Find an Address	blank field	"MAC Address Security Table screens" on page 152
MAC Address	- - - - - - (no address assigned)	
Allowed Source	- (blank field)	
MAC-SA based VLAN	The least active MAC-SA based VLAN will be displayed.	"MAC Address Configuration for MAC-SA-Based VLAN screen" on page 162
Display/Create MAC Address	00-00-00-00-00-00	

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Create VLAN	1	"VLAN Configuration screen" on page 156
Delete VLAN	blank field	
VLAN Name	VLAN # (*VLAN number*)	
Management VLAN	Yes, VLAN #1	
IVL/SVL	IVL	
VLAN Type	Port-based	
Protocol ID (PID)	None	
User-Defined PID	0x0000	
VLAN State	Inactive	
Subnet Addr	0.0.0.0.	
Subnet Mask	0.0.0.0.	
Port Membership	U (all ports assigned as untagged members of VLAN 1)	
Unit	1	"VLAN Port Configuration screen" on page 163
Port	1	
Filter Tagged Frames	No	
Filter Untagged Frames	No	
Filter Unregistered Frames	No	
Port Name	Unit 1, Port 1	
PVID	1	
Port Priority	0	
Tagging	Untagged Access	
Current Stack Operational Mode	Pure BPS 2000 Stack	"Stack Operational Mode screen" on page 199
Next Stack Operational Mode	Pure BPS 2000 Stack	

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Unit	1	"VLAN Display by Port screen" on page 166
Port	1	
PVID	1 (read only)	
Port Name	Unit 1, Port 1 (read only)	
Unit	1	"Port Configuration screen" on page 167
Status	Enabled (for all ports)	
Autonegotiation	Enabled (for all ports)	
Speed/Duplex	100Mbs/Half (when Autonegotiation is Disabled)	
Trunk	1 to 6 (depending on configuration status)	"MultiLink Trunk Configuration Menu screen" on page 173
Trunk Members (Unit/Port)	Blank field	
STP Learning	Normal	
Trunk Mode	Basic	
Trunk Status	Disabled	
Trunk Name	Trunk #1 to Trunk #6	
Traffic Type	Rx and Tx	"MultiLink Trunk Utilization screen" on page 178

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Monitoring Mode	Disabled	"Port Mirroring Configuration screen" on page 180
Monitor/Unit Port	Zero-length string	
Unit/Port X	Zero-length string	
Unit/Port Y	Zero-length string	
Address A	00-00-00-00-00-00 (no MAC address assigned)	
Address B	00-00-00-00-00-00 (no MAC address assigned)	
Packet Type	Both	"Rate Limiting Configuration screen" on page 183
Limit	None	
VLAN	1	"IGMP Configuration screen" on page 188
Snooping	Enabled	
Proxy	Enabled	
Robust Value	2	
Query Time	125 seconds	
Set Router Ports	Version 1	
Static Router Ports	- (for all ports)	
Unit	1	"Port Statistics screen" on page 193
Port	1	
Console Port Speed	9600 Baud	"Console/Comm Port Configuration screen" on page 200
Console Switch Password	Not Required	
Console Stack Password	Not Required	
Console Read-Only Switch Password	user	
Console Read-Write Switch Password	secure	
Console Read-Only Stack Password	user	
Console Read-Write Stack Password	secure	

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Note: The following two fields only appear when the switch is a participant in a stack configuration.		
New Unit Number	Current stack order	"Renumber Stack Units screen" on page 207
Renumber units with new setting?	No	
Unit	1	"Spanning Tree Port Configuration screen" on page 211
Participation	Normal Learning	
Priority	128	
Path Cost	10 or 100	
Bridge Priority	8000 (read only)	"Spanning Tree Switch Settings screen" on page 214
Designated Root	8000 (bridge_id) (read only)	
Root Port	0 (read only)	
Root Path Cost	0 (read only)	
Hello Time	2 seconds (read only)	
Maximum Age Time	20 seconds (read only)	
Forward Delay	15 seconds (read only)	
Bridge Hello Time	2 seconds (read only)	
Bridge Maximum Age Time	20 seconds (read only)	
Bridge Forward Delay	15 seconds (read only)	
TELNET Access	Enabled	"TELNET Configuration screen" on page 217
Login Timeout	1 minute	
Login Retries	3	
Inactivity Timeout	15 minutes	
Event Logging	All	
Allowed Source IP Address (10 user-configurable fields)	First field: 0.0.0.0 (no IP address assigned)	
	Remaining nine fields: 255.255.255.255 (any address is allowed)	

Table 72 Factory default settings (continued)

Field	Default setting	Appears in this CI screen
Allowed Source Mask (10 user-configurable fields)	First field: 0.0.0.0 (no IP address assigned)	
	Remaining nine fields: 255.255.255.255 (any address is allowed)	
Image Filename	Zero-length string	"Software Download screen" on page 219
TFTP Server IP Address	0.0.0.0 (no IP address assigned)	
Start TFTP Load of New Image	No	
Configuration Image Filename	Zero-length string	"Configuration File Download/Upload screen" on page 223
TFTP Server IP Address	0.0.0.0 (no IP address assigned)	
Copy Configuration Image to Server	No	
Retrieve Configuration Image from Server	No	

Appendix H
Sample BootP Configuration File

This appendix provides a sample BootP configuration file. The BootP server searches for this file, called bootptab (or BOOTPTAB.TXT, depending on your operating system), which contains the site-specific information (including IP addresses) needed to perform the software download and configuration. You can modify this sample BootP configuration file or create one of your own.

A sample BootP configuration file follows:

```
# The following is a sample of a BootP configuration file that was extracted
# from a Nortel Networks EZ LAN network management application.  Note that
other BootP daemons can use a configuration file with a different format.
#
# Before using your switch BootP facility, you must customize your BootP
# configuration file with the appropriate data.
#
# Blank lines and lines beginning with '#' are ignored.
#
# Legend:
#
#       first field -- hostname
#                ht -- hardware type
#                ha -- host hardware address
#                tc -- template host (points to similar host entry)
#                ip -- host IP address
#                hd -- bootfile home directory
#                bf -- bootfile
# EZ             dt -- device type
# EZ             fv -- firmware version
# EZ             av -- agent version
#
# Fields are separated with a pipe (|) symbol. Forward slashes (/) are
# required to indicate that an entry is continued to the next line.
#
```

```
# Caution
#
#     Omitting a Forward slash (/) when the entry is continued to the next
#     line, can cause the interruption of the booting process or the
#     incorrect image file to download.  Always include forward slashes
#     where needed.
#
# Important Note:
#
#     If a leading zero (0) is used in the IP address it is calculated as an
#     octal number.  If the leading character is "x" (upper or lower case),
#     it is calculated as a hexadecimal number. For example, if an IP address
#     with a base 10 number of 45 is written as .045 in the BOOTPTAB.TXT file,
#     the Bootp protocol assigns .037 to the client.
#
# Global entries are defined that specify the parameters used by every device.
# Note that hardware type (ht) is specified first in the global entry.
#
# The following global entry is defined for an Ethernet device. Note that this
# is where a client's subnet mask (sm) and default gateway (gw) are defined.
#
global1|/
      |ht=ethernet|/
      |hd=c:\opt\images|/
      |sm=255.255.255.0|/
      |gw=192.0.1.0|
#
# The following sample entry describes a BootP client:

bay1|ht=ethernet|ha=0060fd000000|ip=192.0.0.1|hd=c:\ezlan\images|bf=bps2000_100.img

# Where:
#    host name:                    bay1
#    hardware type:                Ethernet
#    MAC address:                  00-60-FD-00-00-00
#    IP address:                   192.0.0.0
#    home directory of boot file:  c:\ezlan\images
#    boot file:                    bps2000_100.img
```

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